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Richland Environmental Restoration Project

Value Engineering Study Report for Treatment and Disposal of the Mixed Low-Level Waste Retrieved from Burial Ground 218-W-4C

FY 2004

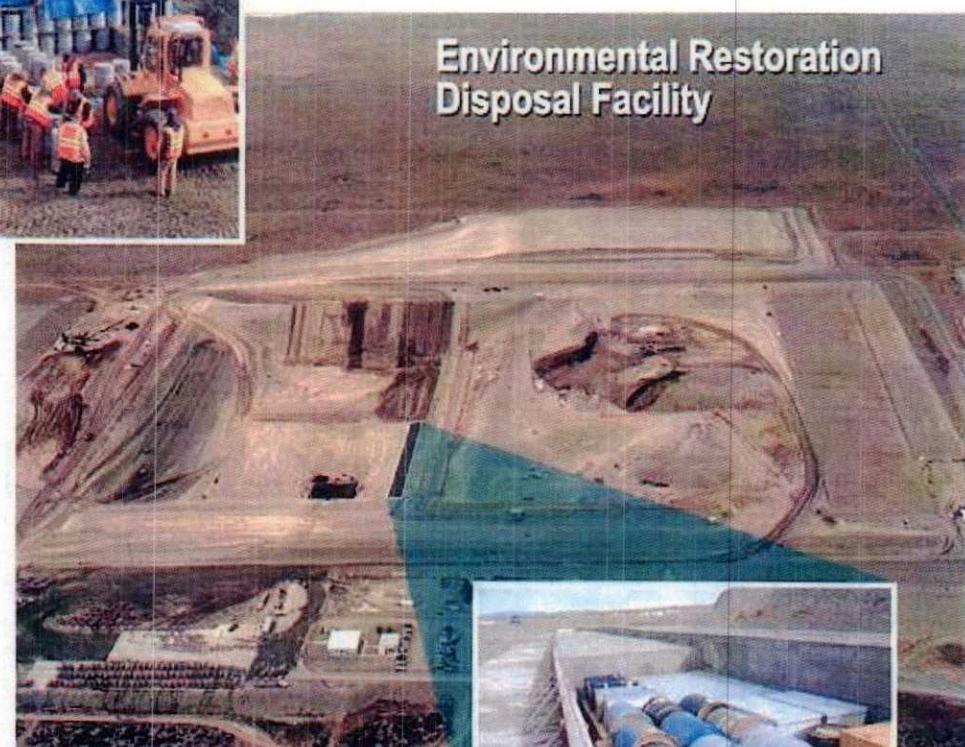
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Burial Ground 218-W-4C

Environmental Restoration Disposal Facility



New Vaults Similar to Structural Monoliths in Hanford's LLBGs



Prepared for the U.S. Department of Energy, Richland Operations Office
Office of Environmental Restoration
Submitted by: Bechtel Hanford, Inc.



Bechtel Hanford, Inc.
Environmental Restoration Contractor

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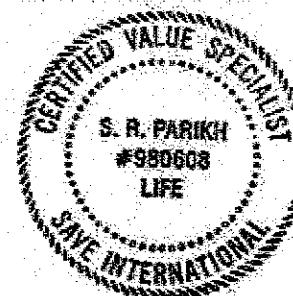
APPROVAL PAGE

Title: Value Engineering Study Report for Treatment and Disposal of the Mixed Low-Level Waste Retrieved from Burial Ground 218-W-4C

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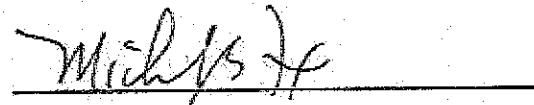


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Value Engineering Study for Treatment and Disposal of the Mixed Low-Level Waste Retrieved from Burial Ground 218-W-4C

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EXECUTIVE SUMMARY

Bechtel Hanford, Inc. (BHI) and Fluor Hanford, Inc. (FH) teamed to identify the "Base Case" and, subsequently, "Options" to provide a reliable path forward for the treatment and disposal of the mixed low-level waste (MLLW) retrieved from Burial Ground 218-W-4C. The "Base Case" and "Options" were analyzed using a Value Engineering (VE) approach, resulting in the development of certain opportunities for effective treatment and disposal of MLLW.

The team of experts from BHI's Environmental Restoration Project and FH's Waste Treatment and Disposal Project performed the VE study. The VE study was performed in two phases: Phase I for identifying the "Base Case" of operations, and pre-screening and selecting "Options" as potential candidates for treatment and disposal of MLLW; and Phase II for identifying selected "Options" (from Phase I), and performing detailed study and evaluation of selected "Options."

Under the Phase I study, the team identified and evaluated the "Base Case" and nine other "Options" as potential candidates for treatment and disposal of MLLW. The results of the evaluation and ranking process used in Phase I identified only five "Options" for further, more detailed study under Phase II.

For ease of reviewing, coordinating, and processing collected data, the Phase II study was carried out in three sub-phases: II A, II B, and II C. Under Phase II A, five "Options" (3, 4, 5, 6, and 9) were identified and evaluated as potential candidates for disposal of MLLW. Subsequently, under Phase II B, "Option 1" was added as another potential candidate for further detailed study. For the "Base Case" and selected "Options" from Phases II A and II B, rough-order-of-magnitude cost estimates for the *Resource Conservation and Recovery Act of 1976* wastes, as appropriate, were prepared using a 3-year lifecycle. Later, under Phase II C, the rankings of the "Base Case" and all "Options," based on (1) lifecycle costing and (2) advantages and disadvantages, were identified and tabulated. In the final analysis, a composite of final rankings were established from the above two rankings.

Executive Summary

The following table summarizes the potential "Base Case," "Options," corresponding lifecycle cost estimates, and final rankings that resulted from the VE study.

Table ES-1. Potential "Base Case," "Options," Corresponding Lifecycle Estimates, and Final Rankings.

Item	Description	3-Year Lifecycle Cost (\$1,000's)	Final Ranking (from Table 7-3)
Base Case	Send drums from CWC to PEcoS for compaction and macro-encapsulation, then dispose in the mixed waste trench.	\$10,345.3	7
Option 1	Send MLLW debris in drums from CWC directly to ERDF, then grout inject drums at ERDF using negative pressure before disposal and macro-encapsulation in ERDF.	\$8,735.5	4
Option 3	Send MLLW debris in drums/overpacks from CWC to PEcoS for super-compaction before sending to ERDF for disposal and macro-encapsulation in ERDF.	\$9,087.8	2
Option 4	Send MLLW debris in drums from CWC directly to a new super-compactor near ERDF for super-compaction, then disposal and macro-encapsulation in ERDF.	\$8,126.6	5
Option 5	Send MLLW debris in drums from CWC directly to ERDF for disposal and macro-encapsulation within procured high-integrity containers placed in ERDF.	\$13,098.2	6
Option 6	Send MLLW debris in drums from CWC directly to ERDF for disposal and macro-encapsulation within ERC designed and constructed structural vault in ERDF.	\$7,346.0	1
Option 9	Send MLLW debris in drums from CWC to PEcoS for super-compaction and macro-encapsulation before sending to ERDF for disposal.	\$9,892.1	3

CWC = Central Waste Complex

ERC = Environmental Restoration Contractor

ERDF = Environmental Restoration Disposal Facility

PEcoS = Pacific EcoSolutions

It is recommended that "Option 6", with least Lifecycle Cost of \$7,346,000 and best Final Ranking of No. 1, should be implemented for Treatment and Disposal of MLLW from Burial Ground 218-W-4C.

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ACRONYMS

AEC	U.S. Atomic Energy Commission
AGEC	Applied Geotechnical Engineering Consultants, Inc.
ALARA	as low as reasonably achievable
BHI	Bechtel Hanford, Inc.
BTR	Buyer's Technical Representative
CERCLA	<i>Comprehensive Environmental Response, Compensation and Liability Act of 1980</i>
CWC	Central Waste Complex
D&D	decontamination and decommissioning
DQO	data quality objective
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EE/CA	engineering evaluation/cost analysis
EPA	U.S. Environmental Protection Agency
ER	environmental restoration
ERC	Environmental Restoration Contractor
ERDF	Environmental Restoration Disposal Facility
FH	Fluor Hanford, Inc.
FY	fiscal year
G&A	General and Administrative
HEPA	high-efficiency particulate air
HIC	high-integrity container
LCC	lifecycle cost
LDR	land disposal restrictions
LLBG	low-level burial ground
LLW	low-level waste
MLLW	mixed low-level waste
NCO	nuclear chemical operator
NDA	nondestructive assay
NucFil	nuclear filter
PEcoS	Pacific EcoSolutions
PIC	person in charge
OWTF	Onsite Waste Tracking Form
RadCon	Radiological Controls
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
RCT	radiological control technician
RL	U.S. Department of Energy, Richland Operations Office
ROM	rough order of magnitude
SAP	sampling and analysis plan
SWITS	Solid Waste Information and Tracking System
SWOC	Solid Waste Operations Complex
Tri-Party	<i>Hanford Federal Facility Agreement and Consent Order</i>
Agreement	
TSD	treatment, storage, and disposal

Acronyms

TSDR	treatment, storage, and disposal representative
TRU	transuranic
VE	Value Engineering
VM	Value Methodology
VRF	volume reduction factor
WMR	waste management representative
WS	Waste Services

METRIC CONVERSION CHART

Into Metric Units			Out of Metric Units		
If You Know	Multiply By	To Get	If You Know	Multiply By	To Get
Length			Length		
inches	25.4	millimeters	millimeters	0.039	inches
inches	2.54	centimeters	centimeters	0.394	inches
feet	0.305	meters	meters	3.281	feet
yards	0.914	meters	meters	1.094	yards
miles	1.609	kilometers	kilometers	0.621	miles
Area			Area		
sq. inches	6.452	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.093	sq. meters	sq. meters	10.76	sq. feet
sq. yards	0.836	sq. meters	sq. meters	1.196	sq. yards
sq. miles	2.6	sq. kilometers	sq. kilometers	0.4	sq. miles
acres	0.405	hectares	hectares	2.47	acres
Mass (weight)			Mass (weight)		
ounces	28.35	grams	grams	0.035	ounces
pounds	0.454	kilograms	kilograms	2.205	pounds
ton	0.907	metric ton	metric ton	1.102	ton
Volume			Volume		
teaspoons	5	milliliters	milliliters	0.033	fluid ounces
tablespoons	15	milliliters	milliliters	2.1	pints
fluid ounces	30	milliliters	milliliters	1.057	quarts
cups	0.24	liters	liters	0.264	gallons
pints	0.47	liters	liters	35.315	cubic feet
quarts	0.95	liters	liters	1.308	cubic yards
gallons	3.8	liters	liters		
cubic feet	0.028	cubic meters	cubic meters		
cubic yards	0.765	cubic meters	cubic meters		
Temperature			Temperature		
Fahrenheit	subtract 32, then multiply by 5/9.	Celsius	Celsius	multiply by 9/5, then add 32	Fahrenheit
Radioactivity			Radioactivity		
picocuries	37	millibecquerel	millibecquerels	0.027	picocuries

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1.0 INTRODUCTION

1.1 PURPOSE OF THIS DOCUMENT

The purpose of this report is to document a joint Bechtel Hanford, Inc. (BHI) and Fluor Hanford, Inc. (FH) team effort to identify a reliable and cost-effective path forward for the treatment and disposal of mixed low-level waste (MLLW) from Burial Ground 218-W-4C.

1.2 BACKGROUND INFORMATION

Approximately 9,000 drums of MLLW from the 218-W-4C Trench are being proposed for treatment and disposal in the Environmental Restoration Disposal Facility (ERDF). Some background information on the waste has been extracted from the draft Action Memo and is given below.

In 1970, the U.S. Atomic Energy Commission (AEC) defined transuranic (TRU) waste as a separate waste category and declared that TRU waste must be retrievable. Suspect-TRU waste (identified as waste known or suspected to contain TRU elements) was separated from low-level waste (LLW) and retrievably stored in the 200 Area burial grounds. In 1973, the AEC changed the definition of TRU waste to "waste containing greater than 10 nCi/g of TRU radionuclides." The definition of TRU was changed again in 1984 to specify only waste containing greater than 100 nCi/g of TRU radionuclides; therefore, some of the suspect TRU waste initially placed in storage is now defined as LLW.

Since 1970, approximately 37,400 suspect-TRU waste containers have been placed in retrievable storage at the Hanford Site. The waste container contents include failed process equipment such as pumps, resin columns, and tanks; laboratory and room trash, including paper, plastics, glassware, cloth, and solidified liquids; and decontamination and decommissioning (D&D) rubble, including concrete, piping, and soils.

The LLW and MLLW that is being retrieved from Burial Ground 218-W-4C is contaminated with hazardous substances, including radionuclides. Burial Ground 218-W-4C contains approximately 18,000 drums (55-gal) and 400 other containers of a mixture of suspect-TRU waste. The plutonium inventory within the containers stored in 218-W-4C may total approximately 380,000 g, which represents nearly three-quarters of the plutonium inventory within all the post-1970 suspect-TRU burial grounds.

The portion of the waste proposed for ERDF disposal consists of approximately 9,000 drums containing TRU-contaminated miscellaneous solid wastes with contamination rates of most between 10 and 100 nCi/g. Hazardous substances are present, which requires macro-encapsulation of the waste. Delivery of the waste will probably begin in the second quarter of fiscal year 2004 (FY04) and conclude in the last quarter of FY 2007.

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In general, the process steps of the retrieval project are to expose a drum sitting on the existing asphalt pad, identify the container based on the disposal history, and review the existing process knowledge. If previous nondestructive assay (NDA) data for the drum report a plutonium content of greater than 2 g, the drum is staged for shipment to Central Waste Complex (CWC) as TRU waste. Drums with plutonium content less than 2 g are removed from the asphalt pad and placed in the mobile assay facility at the burial ground to obtain the weight of the container and NDA analysis. If the drum is confirmed as LLW, it will be prepared and transported to ERDF for disposal, provided it meets the ERDF waste acceptance criteria. If the waste designates as MLLW, it will be evaluated to determine whether it meets land disposal restrictions (LDRs) and, if not, whether appropriate treatment is available at ERDF.

It is anticipated that approximately 90% of the suspect MLLW is debris waste and will be treated to meet LDRs via macro-encapsulation prior to disposal at ERDF. Disposal at ERDF will be the preferred path, provided that the waste meets ERDF waste acceptance criteria. If the waste does not meet the ERDF waste acceptance criteria, it will be evaluated for disposal in the MLLW trenches in the Low-Level Burial Grounds (LLBG).

Secondary waste generated by this removal action, such as protective clothing, contaminated soils, and other wastes that are LLW or MLLW that meet or can be treated to meet the waste acceptance criteria for ERDF, may be disposed at ERDF. If ERDF cannot be used for disposal, the U.S. Department of Energy (DOE) may, upon U.S. Environmental Protection Agency (EPA) approval, use the CWC and lined trenches in the LLBG as environmentally protective management facilities, provided that the waste and these facilities are managed in accordance with applicable requirements for offsite facilities.

1.3 PROBLEM STATEMENT

The vast majority of drums are reported to be filled with "step-off-pad-type" waste. Because of this, the drums are considered to have significant void space potential that will destroy the integrity of the future ERDF cap if not addressed. The requirement to macro-encapsulate the waste must also be incorporated into the solution. A significant factor is the dwindling amount of floor space available on the 35-ft level of ERDF Cell 3. This is the only floor space available for disposal until Cells 5 and 6 are completed at the end of calendar year 2004. Additional factors include potential impacts to the ERDF authorization basis and probable air monitoring plan revisions.

1.4 NEED AND MISSION

To cope with above-mentioned problem, an evaluation of potential optional methods will be required to select a method by which ERDF can receive, treat, and dispose of this waste stream with least possible lifecycle cost (LCC). A "Base Case" will need to be considered for comparison purposes. The evaluation will use a Value Engineering (VE) process and consider a limited set of treat-and-dispose options against criteria that will be determined in meetings. The

Introduction

LCC estimates for the "Base Case" and selected "Options" will be prepared and used for final selection and recommendation to management.

1.5 VALUE ENGINEERING

BHI has developed a highly successful Value Methodology (VM) (synonymous with Value Engineering [VE]) Program to improve/add value to environmental restoration (ER) activities at the Hanford Site. VE provides systematic application of recognized techniques that identify the function of the product, system, or service; establish the worth of those functions; and provide the necessary functions to meet the required performance at the lowest LCC.

The purpose of employing VE was (1) to systematically review the "Base Case" for treatment and disposal of MLLW from TRU retrieval operations, and (2) to identify "Options" for treatment and disposal of MLLW. In the final analysis, "Options" that would meet the requirements at the lowest possible LCC and provide the maximum advantage would be recommended for implementation. A 3-year lifecycle was adopted for the "Base Case" and selected "Options."

Beginning in Section 2.0 of this report, detailed descriptions of various phases of the VE study (and corresponding LCCs for the "Base Case" and "Options" for treatment and disposal of MLLW) are provided. Recommended options, savings, and implementing requirements are summarized in Section 8.0.

Introduction

2.0 VALUE ENGINEERING STUDY

2.1 GENERAL INFORMATION

A team of experts from BHI's ER Project and FH's Waste Treatment and Disposal Project were identified to perform a VE study in support of providing a cost-effective and reliable method for treatment and disposal of MLLW from Burial Ground 218-W-4C. The VE study was facilitated by a Certified Value Specialist and was performed in two phases:

- *Phase I:* Identify the "current practice" of operations and pre-screen and select "Options" as potential candidates for treatment and disposal of MLLW from Burial Ground 218-W-4C.
- *Phase II:* Identify selected "Options" (from Phase I), and perform detailed study and evaluation of selected "Options" for treatment and disposal of MLLW from Burial Ground 218-W-4C.

The team members were briefed on the scope of each phase of the study and were informed about the deliverables required at the end of each study phase. Team members were also informed that VM techniques would be used in generating the deliverables. Team members were given a short presentation on the VM process, which uses a systematic job plan consisting of three major activities:

- Pre-study stage
- Value study stage
- Post-study stage (*to be carried out after implementation of selected method*).

2.2 ORGANIZATION OF THE VALUE ENGINEERING STUDY

The Phase I study, which is detailed in Section 3.0, covers the requirements of the VM pre-study stage.

The Phase II study covers the requirements of the VM value study stage and is further subdivided into three sub-phases, as follows:

- *Phase IIA:* Review the assumptions and preliminary cost estimates of the "Base Case" and selected "Options" detailed in Section 4.0.
- *Phase IIB:* Review the progress of the VE study and selected "Options" with the DOE Project Manager.
- *Phase IIC:* Review the advantages and disadvantages of the "Base Case" and "Options."

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3.0 PHASE I: REQUIREMENTS OF THE VALUE METHODOLOGY PRE-STUDY STAGE

NOTE: The information in this section is taken from VE Study No. 0600X-VE-G0002, which was conducted on March 29, 2004.

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3.1 SCOPE OF THE PHASE I STUDY

The scope for Phase I of the study is outlined as follows:

Step 1: Verify if the data currently available for MLLW are accurate for this study (e.g., number of drums, size and condition of drums, etc.).

Step 2: Identify the current practice of operations ("Base Case") for MLLW.

Step 3: Develop and weigh criteria using a "paired comparison" technique for evaluation.

Step 4: Brainstorm and identify for consideration the "Options" that may lead to waste minimization and provide effective and safe disposal of the waste to ERDF.

Step 5: Evaluate each "Option" against the criteria developed in Step 3, and score each "Option."

Step 6: Select the top-scoring and most viable "Options" as potential candidates for further detailed evaluation and cost estimation.

3.1.1 Deliverables for Phase I

- Ia – Criteria for evaluation of potential "Options" for waste remediation.
- Ib – MLLW quantities for treatment and disposal to ERDF.
- Ic – Estimated cost of remediation for the "Base Case," as provided by FH.
- Id – Potential remediation "Option(s)" for the treatment and disposal of the MLLW.
- Ie – Evaluation of all "Options" using criteria developed.
- If – List and description of "Base Case" and selected "Option(s)" for further development.

3.2 PHASE I STUDY (MARCH 29, 2004)

3.2.1 Criteria for Evaluation of "Options" for Treatment and Disposal of Mixed Low-Level Waste

Team members brainstormed and developed a set of criteria for evaluation of potential "Options" as follows:

1. Probability of Success

What would be the probability of feasibility for this "Option" for treating and disposing MLLW?

2. Potential for Meeting Fluor Hanford's initial shipment date

Can the process of this "Option" be up and running in time to meet the probable initial shipment date of June 1, 2004, for MLLW from FH?

3. Safety

What would be the extent of difficulty in achieving ergonomic, as low as reasonably achievable (ALARA), and Radiological Controls (RadCon) requirements in implementing this "Option"?

4. Compatibility with Hazard Classification

How will this "Option" fall within the hazard classification of the ERDF?

5. Landfill Space Requirements

How much floor space in the landfill cell will be required for the treat/disposal method specified in this "Option"?

**Phase I:
Requirements of the Value Methodology Pre-Study Stage**

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6. Long-Term Stability

How well does this "Option" provide for long-term stability of the ERDF cap?

7. Regulatory Compliance

How well does this "Option" satisfy requirements of applicable laws and regulations?

8. Infrastructure

How well can this "Option" utilize existing infrastructure?

The criteria were weighed for relative importance using the VM paired comparison technique (see Table 3-1).

Table 3-1. Weighting Criteria for "Options" for Mixed Low-Level Waste Retrieval, Treatment, and Disposal.

	B	C	D	E	F	G	H	EVALUATION CRITERIA	Score	Percent
A	A3 B2	A2 B3	A1 D3	A3 E2	A2 F3	A2 G3	A3 H1	Probability of Success	16	14
	B1 C3	B1 D3	B2 E1	B1 F3	B1 G3	B1 H1	B1 H1	Potential for Meeting FH Initial Shipment Dates	9	8
C	C2 D3	C3 E1	C3 F2	C3 G3	C3 H1			Safety	20	17
	D3 E1	D3 F2	D3 G2	D3 H1				Compatibility with Authorization Basis	21	18
D	E1 F2	E1 G2	E1 H1					Landfill Space Requirements	8	7
	F2 G3	F3 H1						Long-Term Stability	17	15
E	G3 H1							Regulatory Compliance	19	16
	H							Use of Existing Infrastructure	7	6
TOTALS									117	100
How Important										
1. Minor Preference										
2. Medium Preference										
3. Major Preference										

3.2.2 MLLW Quantities for Treatment and Disposal to ERDF

Approximately 9,000 drums of MLLW are expected to be retrieved from Burial Ground 218-W-4C, located west of the Plutonium Finishing Plant in the Hanford Site's 200 West Area. As a recommendation from the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 2003) Interagency Management Integration Team subcommittee dealing with Hanford's waste disposal options, the disposal path forward for this MLLW is ERDF. FH's MLLW Treatment and Disposal Program has been assigned the project to disposition this waste. This project includes two main sub-tasks: (1) drafting and issuing required *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) documentation to allow disposition of the waste to ERDF, and (2) physically implementing the project. The estimated cost for the first sub-task is \$140,000, which is based on comparable actual FY03 costs incurred for the 183-H Basin Waste Disposal Project. The cost estimate for the second sub-task is the primary objective of LCC analysis and will be performed on the "Base Case" and selected "Options."

To establish a base set of physical inputs for the LCC analysis, project-level information on the waste was considered:

- Of the 9,000 drums of MLLW, approximately 90% (about 8,100 drums) are anticipated to meet the *Resource Conservation and Recovery Act of 1976* (RCRA) definition of "debris." The remaining quantity (about 900 drums) is anticipated to be MLLW not meeting the definition of "hazardous debris" and will have to be stored in the CWC until treatment capability becomes available.
- The debris waste is currently the only waste being evaluated at this time, as it comprises the majority of the waste. Disposal options for non-debris MLLW need to be analyzed in greater detail at a later date.
- The majority (>98%) of the drummed debris waste is 55 gal in size (nominally 0.208 m^3 or 7.34 ft^3 per drum). Some 85-gal-size (nominally 0.322 m^3 or 11.37 ft^3 per drum) drums are also expected to be removed from Burial Ground 218-W-4C. For the purpose of this cost analysis, all drums are assumed to be 55 gal in size.
- Waste retrieval from 218-W-4C began in November 2003 and is anticipated to continue through FY06.
- Based on retrieval rates and project funding guidance, the following number of MLLW debris waste packages are anticipated to be dispositioned each FY:
 - FY04: 1,600 drums (approximately 333 m^3)
 - FY05: 3,250 drums (approximately 676 m^3)
 - FY06: 3,250 drums (approximately 676 m^3).

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- The average gross weight for the 55-gal debris waste packages is anticipated to be between 150 to 200 lb. For the purpose of this LCC, 200 lb is used as the average gross weight.
- The debris is comprised mainly of soft compactable debris (e.g., paper, cloth, rubber, personal protective equipment, etc.), as well as various types and amounts of metal.
- The anticipated number of waste packages per shipment for the various types of waste forms is as follows:
 - For 55-gal waste packages shipped from FH to ERDF and/or Pacific EcoSolutions (PEcoS): 30 drums per load based on size limiting (assumes 44-ft trailer).
 - For 85-gal overpacks containing 55-gal waste packages shipped from FH to PEcoS: 40 drums per load based on size limiting (assumes 44-ft trailer).
 - For 85-gal overpacks containing super-compacted 55-gal waste packages shipped from PEcoS to ERDF: 30 drums per load based on weight limiting (1,000 to 1,400 lb each, using 1,200 lb as the average).
 - For 110-gal macro-encapsulated waste packages shipped from PEcoS to ERDF: 20 drums per load based on weight limiting (1,600 to 2,000 lb each, using 1,800 lb as the average).
- The estimated cost for an 85-gal overpack container is \$125.00 each.
- Current FY04 dollars are to be used (i.e., no cost excaluation).
- The resulting cost estimate shall be in total project cost as incurred by FH (e.g., General and Administrative [G&A] overheads for the BHI, ERDF, and PEcoS subcontracts need to be applied) for the duration of the project (i.e., through FY06).

**Table 3-2. Estimated Cost of Remediation for "Base Case,"
as Provided by Fluor Hanford, Inc. (2 Pages)**

Cost Estimate for Sending MLLW Debris from CWC to PEcoS for Compaction and Macro-E encapsulation, Then Dispose at the Mixed Waste Trench (Base Case)					
Performed by: Dean E. Nester					
Estimated Number of 55-gal Packages =	\$100				
Estimated Waste Package Volume (m ³) =	1,683	0.208 cu. Meters			
Estimated Number of Shipments from CWC to PEcoS =	263	40 55-gal overpacks per load			
Estimated Number of Shipments from PEcoS to MWT =	81	20 110-gal drums load based on 2.5:1 VRF			
PEcoS Cost Per Package for Compaction and Macro-E encapsulation =	\$500	RDM cost estimate from PEcoS (March 2004)			
Task	Craft Type	Number	Hours/Task	Frequency	Costs
CERCLA document development (Includes EECVA, DQO/SAP, treatment plan, etc.)	WS Technical Lead	1	1	1	\$140,000
Negotiate and issue PEcoS contract CR	BTR	1	40	1	\$2,500
Project implementation management (Includes PEcoS lists, profiles, OWTIs, SWITS updates)	Project Lead	1	0.5	\$100	\$315,000
Overpack 55-gal packages at CWC (Includes pre-jobs)	Waste Data Administrator	1	0.2	\$100	\$31,000
	NCO	3	0.75	\$100	\$1,002,375
	RCT	2	0.25	\$100	\$222,750
	PIC	1	0.25	\$100	\$131,525
55-gal overpacks (reuse four times)	Purchase	1	1	203	\$253,125
Ship packages from CWC to PEcoS (Includes pre-jobs, shipment staging, surveys/material and labor, loading)	NCO	3	10	203	\$535,920
	RCT	2	3	203	\$178,640
	Teamster	1	4	203	\$40,000
	Striper	2	24	203	\$720,000
	PIC	1	2	203	\$26,350
PEcoS compact and test	Contract transportation			203	\$162,400
	Contract G&A (20%)				\$32,480
	Contract			8100	\$4,050,000
	Contingency (15%)				\$675,000
	Contract G&A (30%)				\$931,500
Treated waste return and disposal	WMR	1	16	81	\$77,760
	TSDR	1	8	81	\$38,580
	Ops Reviews	3	4	81	\$10,440
	Record Administrator	1	2	81	\$8,100
	NCO	2	6	81	\$71,280
	RCT	2	4	81	\$35,640
	Ops PIC	1	4	81	\$17,820
	Crane & Rigging				
	Riggers	4	6	81	\$142,560
	Teamster	1	6	81	\$32,400
	Crane Operator	1	8	81	\$35,640
	Field Work Super	1	4	81	\$19,340
	Contract Transportation			81	\$84,300
	Contract G&A (20%)				\$12,860
	Subtotal				\$10,022,325
	Total				\$10,832,325
	Est. Added Cost (\$/m³)				\$5,948
					Last updated 3/30/04

Assumption: FY04 fully burdened labor rates are used.

BTR = Buyer's Technical Representative
DQO = data quality objective
EECA = engineering evaluation/cost analysis
MWT = mixed waste trench
NCO = nuclear chemical operator
OWTT = Onsite Waste Tracking Team
PIC = person in charge
RCT = radiological control technician

ROM = rough order of magnitude
SAP = sampling and analysis plan
SWITS = Solid Waste Information and Tracking System
TSDR = treatment, storage, and disposal representative
VRF = volume reduction factor
WMR = waste management representative
WS = Waste Services

3.2.3 List of Identified "Options"

- Option 1:* Send MLLW debris in drums from CWC directly to ERDF, then grout-inject drums at ERDF using negative pressure before disposal and macro-encapsulation in ERDF.
- Option 2:* Send MLLW debris in drums from CWC directly to ERDF, then void-fill drums using grout fill/glovebag at ERDF before disposal and macro-encapsulation in ERDF.
- Option 3:* Send MLLW debris in drums/overpacks from CWC to PEcoS for super-compaction before sending to ERDF for disposal and macro-encapsulation in ERDF.
- Option 4:* Send MLLW debris in drums from CWC directly to a new super-compactor near ERDF for super-compaction, then disposal and macro-encapsulation in ERDF.
- Option 5:* Send MLLW debris in drums from CWC directly to ERDF for disposal and macro-encapsulation within procured high-integrity containers placed in ERDF.
- Option 6:* Send MLLW debris in drums from CWC directly to ERDF for disposal and macro-encapsulation within Environmental Restoration Contractor (ERC)-designed and procured structural vault in ERDF.
- Option 7:* Send MLLW debris in drums from CWC directly to ERDF for disposal and macro-encapsulation within Environmental Restoration Contractor (ERC)-designed and procured structural horizontal pipes placed in ERDF.
- Option 8:* Send MLLW debris in drums from CWC directly to ERDF, then void-fill drums with grout injection to meet macro-encapsulation before disposal in ERDF. (This assumes that injected drums require no further macro-encapsulation.)
- Option 9:* Send MLLW debris in drums from CWC to PEcoS for super-compaction and macro-encapsulation before sending to ERDF for disposal.

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3.2.4 Evaluation and Ranking of "Options"

Table 3-3. Evaluation and Ranking of "Options." (2 Pages)

CATEGORY: MLLW Retrieval, Treatment, and Disposal	MATRIX ANALYSIS										
	Probability of Success	(1) Objectives or Criteria									
		Potential Pilot Meeting FII Initial Ship Date	Safety	Compatibility with Authorization Basis	Health/Safety Requirements	Long Term Stability	Regulatory Compliance	Use of Existing Infrastructure	Cost	Space	
(2) Options ↓	(3) Weight →	(4) Sum	(5) Rank	(6) Comments							
Option 1: Send MLLW debris in drums from CWC directly to ERDF, then grout-inject drums at ERDF using negative pressure before disposal and macro-encapsulation in ERDF.	1.00 0.99	7.00 6.94	3.00 2.94	7.00 6.94	7.00 6.94	8.00 7.94	8.00 7.94	7.00 6.94		6	Requested for detailed study by RJ on 04/29/04
Option 2: Send MLLW debris in drums from CWC directly to ERDF, then void-fill drums using glove bag/glovebox at ERDF before disposal and micro-encapsulation in ERDF.	4.00 0.55	4.00 0.31	2.00 0.34	6.00 1.98	7.00 6.48	8.00 7.16	7.00 7.14	6.00 6.97		9	
Option 3: Send MLLW debris in drums overpacks from CWC to PEcoS for super-compaction before sending to ERDF for disposal and macro-encapsulation in ERDF.	9.00 1.23	8.00 6.62	8.00 1.57	9.00 1.63	10.00 6.68	10.00 7.43	7.00 7.14	8.00 7.30		2	Recommended for detailed study
Option 4: Send MLLW debris in drums from CWC directly to a new Super-compressor near ERDF for super-compaction, then disposal and macro-encapsulation in ERDF.	9.00 1.23	1.00 0.08	6.00 1.03	6.00 1.08	10.00 6.68	10.00 7.45	7.00 7.14	3.00 6.49		7	
Option 5: Send MLLW debris in drums from CWC directly to ERDF for disposal and macro-encapsulation within procured high-integrity containers placed in ERDF.	10.00 1.37	4.00 0.31	9.00 1.54	8.00 1.44	6.00 0.41	6.00 0.87	9.00 1.46	9.00 1.46		3	Recommended for detailed study

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Table 3-3. Evaluation and Ranking of "Options." (2 Pages)

CATEGORY: MLLW Retrieval, Treatment, and Disposal		MATRIX ANALYSIS									
		(1) Objectives or Criteria									
		Probability of Success	Potential for Meeting PUC Initial Ship Dates	Supply	Compatibility with Authorization Basis	Landfill Space Requirements	Long Term Stability	Regulatory Compliance	Use of Existing Infrastructure	Cost	Risk
(2) Options	(3) Weight →										
Option 6: Send MLLW debris in drums from CWC directly to ERDF for disposal and macro-encapsulation within ERC-designed and constructed structural vault in ERDF.	1.00	3.00	3.00	3.00	3.00	3.00	7.00	9.00	6.00		5
	1.23	0.23	1.37	1.44	0.34	1.02	1.45	0.97	3.06		
Option 7: Send MLLW debris in drums from CWC directly to ERDF for disposal and macro-encapsulation within ERC-designed and procured structural horizontal pipes placed in ERDF.	3.00	7.00	3.00	8.00	6.00	6.00	9.00	3.00			4
	1.09	0.54	1.37	1.44	0.41	0.57	1.46	1.30	3.48		
Option 8: Send MLLW debris in drums from CWC directly to ERDF, then void-fill drums with grout injection to meet macro-encapsulation before disposal in ERDF. (This assumes that injected drums require no further macro-encapsulation.)	3.00	7.00	3.00	7.00	7.00	7.00	6.00	7.00			3
	1.09	0.54	0.51	1.26	0.43	1.02	6.97	1.14	7.01		
Option 9: Send MLLW debris in drums from CWC to PEcoS for super-compression and macro-encapsulation before sending to ERDF for disposal.	10.00	8.00	3.00	10.00	9.00	10.00	8.00	8.00			2
	1.37	0.62	1.37	1.79	0.62	1.45	1.30	1.30	9.81		

RL = U.S. Department of Energy, Richland Operations Office

3.2.5 List and Description of "Base Case" and Selected "Option(s)" for Further Development

In addition to the "Base Case" defined by FH, the VE study team ranked nine different options against eight criteria to derive a short list of five options for LCC. The short list of selected options is detailed below, beginning with the highest ranked and proceeding to the lowest ranked:

- **Base Case** – Super-compact drums and macro-encapsulate them prior to delivery to the Mixed Waste Disposal Unit for disposal. FH overpacks 55-gal drums and ships them to PECoS under U.S. Department of Transportation (DOT) requirements. The drums would be super-compacted, placed into 110-gal overpacks, and grouted for macro-encapsulation with an assumed volume reduction factor (VRF) of 1.5:1 overall. The completed packages would be shipped to the Mixed Waste Disposal Unit located in the 200 West Area of the Hanford Site, where the drums would be disposed by place-and-cover methods. Mixed waste disposal costs are based on the actual costs associated with disposal of other treated MLLW under the MLLW Treatment and Disposal Project. Weight per package is estimated at 1,600 to 2,000 lb each.
- **Option 9** – Super-compact and macro-encapsulate drums prior to delivery to the ERDF. FH overpacks 55-gal drums and ships them to PECoS under DOT requirements. The drums would be super-compacted, placed into 110-gal overpacks, and grouted for macro-encapsulation with an assumed VRF of 2.5:1 overall. The completed packages would be shipped to the ERDF where they would be disposed by place and cover methods. The ERDF costs would include standard disposal cost/ton of waste for the entire package received at the ERDF. Weight per package is estimated at 1,600 to 2,000 lb each.
- **Option 3** – Super-compact drums before macro-encapsulation at the ERDF: FH overpacks 55-gal drums and ships them to PECoS under DOT requirements. The drums would be super-compacted, placed inside 85-gal overpacks, and void-filled with sand. The overall VRF would be 3:1 (3 pucks/OP). The completed packages would be shipped to the ERDF, where they would be placed on a mega-macro pad and macro-encapsulated using standard ERDF methods. A total of 157 packages would be grouted on each pad.
- **Option 5** – Macro-encapsulate within structural vault using a high-integrity container (HIC): The 55-gal drums would be placed into HICs at the ERDF. The drums would be grouted for macro-encapsulation and a structural lid would be placed on the HIC. Volume utilization of the HIC is estimated by FH to be approximately 50%. Drums could be double- or triple-stacked inside the HIC. The ERDF would need to use cranes to handle the HICs, the drums, and their lids. The voids within the HIC would be filled with the low-strength, flowable grout that ERDF uses for macro-encapsulation.
- **Option 7** – Macro-encapsulate within structural vault using horizontal pipes: Horizontal pipes would be laid on the floor of the active cell (or on the 35-ft level). Drums (55 gal) would be placed inside the pipes and partially grouted to "pin" them in place. A second

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grout campaign would completely fill the pipes. The size and type of the pipes would be determined by structural analysis. The benefit of this method is that it takes advantage of the culvert effect of diverting overlying load around the horizontal drums. The key difficulty to be overcome would be loading the drums into the pipes.

- *Option 6* – Macro-encapsulate within a structural vault using grout with a structural design. Slip-formed walls would be poured around a pad holding the 55-gal drums. Drums would be stacked four levels high. Voids would be filled with grout and a designed, reinforced, structural lid would be poured over the top of the filled unit.

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4.0 PHASE II: REVIEW ASSUMPTIONS AND PRELIMINARY COST ESTIMATES OF "BASE CASE" AND SELECTED "OPTIONS"

NOTE: The information in this section is taken from VE Study No. 0600X-VE-G002, which was conducted on April 26, 2004.

TEAM MEMBERS AND OTHER ATTENDEES

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S. R. Parikh	372-9180	Project Engineering Manager Certified Value Specialist - Life	BHI

4.1 SCOPE OF THE PHASE II STUDY

The scope for the Phase II of the study is outlined as follows:

Step 1: Assign Cost Estimator to prepare LCCs for the "Base Case" and each of the selected "Option(s)."

Step 2: Obtain cost data and other pertinent information from FH for preparing the LCC for the "Base Case."

Step 3: Verify if data currently available for selected "Options" are accurate and validated.

Step 4: Prepare LCCs for selected "Options."

Step 5: Generate advantages and disadvantages of the selected "Options" and "Base Case."

Step 6: Review the LCCs for the "Base Case" and the selected "Option(s)."

Step 7: Select and make recommendation of the method of remediation of MLLW.

4.1.1 Deliverables for Phase II

- IIa – Assumptions for VE study estimate of MLLW Retrieval, Treatment, and Disposal Project, FY04.
- IIb – Estimates of LCCs for each of the potential "Option(s)" and "Base Case."
- IIc – Advantages and disadvantages of each of the potential "Option(s)" and "Base Case."
- IId – A summary of ranking comparison of items from Phases IIb and IIc.
- IIe – Recommendation for implementation of one of the "Option(s)" for remediation of MLLW.

For ease of reviewing, coordinating, and processing of collected data, the Phase II Study was carried out in three (3) sub-phases: IIA, IIB, and IIC.

4.2 PHASE II A STUDY SUMMARY (APRIL 26, 2004)

Initially, the "Base Case" and "Options 3, 5, 6, 7, and 9" were selected for further detailed development. It was, however, determined that "Option 7" would require a substantial amount of time to perform structural analysis of the pipes and will not meet FH shipment date; hence, "Option 7" was excluded from further development.

Additionally, it was determined that "Option 4" for super-compaction at ERDF should be carried further for detailed development to investigate its potential.

Participants reviewed initial rough estimates and corresponding assumptions for the "Base Case" and selected "Options 3, 4, 5, 6, and 9."

Comments were given to the Cost Estimator for further refinement of the assumptions and the LCCs.

5.0 PHASE II(B: REVIEW PROGRESS OF VALUE ENGINEERING STUDY AND SELECTED "OPTIONS"

NOTE: The information in this section is taken from VE Study No. 0600X-VE-G002, which was conducted on April 29, 2004.

TEAM MEMBERS AND OTHER ATTENDEES

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S. R. Parikh	372-9180	Project Engineering Manager Certified Value Specialist – Life	BHI

5.1 PHASE II(B STUDY (APRIL 29, 2004)

A comprehensive overview of the progress of the VE study was provided to RL. A list of "Options" and a set of criteria for evaluating options were reviewed, and the method used for ranking all "Options" was explained. Upon review of the selected "Options" for further development, RL suggested that "Option 1" also be considered for further development and LCC. RL was assuming that all drums would have nuclear filter (NucFil)-type, high-efficiency particulate air (HEPA) filters installed, and that the filters installed would have sufficient air-flow capacity to pass the air that would be displaced by grout injection. RL also suggested a slight alteration to "Option 1," placing a vacuum hose over the NucFil, which would have mitigated much of the RadCon concern regarding the option. As such, "Option 1" was added to the list of options to be developed in more detail.

**5.2 ASSUMPTIONS FOR VALUE ENGINEERING STUDY ESTIMATE
OF MIXED LOW-LEVEL WASTE RETRIEVAL, TREATMENT,
AND DISPOSAL PROJECT**

The VE study estimates were prepared to compare various options of contaminated barrel disposal at ERDF and should not be construed as definitive in nature. The purpose of the estimates is to facilitate a decision, reduce or eliminate the number of options, or determine if further analysis is needed relative to the VE assessment of the options. They are order-of-magnitude estimates only, not fair price estimates, so caution should be taken if these estimates are used for any other purpose.

Vendor equipment recommendations and associated costs were obtained verbally. Key among these are the compactor unit and an estimated price from a local offsite compaction facility to perform the service. FH provided recent unit prices for their related portion and ERDF disposal costs, which were based on recent unit prices. "Penalty costs" for construction of additional disposal space at ERDF were not considered, as many other factors would determine additional ERDF capacity needs. In general, prices are consistent between options, so the relative comparison would remain the same, even though estimated costs are not definitive.

Within the various options are unknown possibilities that could significantly increase cost or schedule. "Option 4," in particular, which examines purchase, installation, and operation of compactor and facility at ERDF, does not address such things as specific location, unknown modifications to purchased equipment, or potential modification to the authorization basis. The facility housing the compactor in this option was sized to allow a trailer to be parked inside for unloading and also allows room for a laydown area. Safety and/or radiation considerations would ultimately dictate whether this is a valid assumption or not.

It was assumed that the "Option 4" compaction operation would continue after size reduction of the CWC barrels (after 2006), so demolition and disposal costs of the compactor and facility are not included. The VE team addressed the consideration that the facility was built only for the barrel compaction and, therefore, the demolition costs should be included. Due to the unknown factors, but perceived likelihood, of the future operations, the team chose not to include these costs. Operating costs for each year through 2006 are included. *(Option 4 was not originally included with the Phase I options, but was added as a point of consideration during estimate development at the request of the DOE-RL representative.)*

Additionally, "Option 1" was also not included with the Phase I "Options," but was added as a point of consideration during estimate development at the request of U.S. Department of Energy, Richland Operations Office (RL) representative.

As a result of relative unknown factors, contingency factors were applied to specific areas of each estimate where cost/risk was thought to be the greatest. An overall contingency percentage was not applied to any option in total because it would unfairly increase known unit prices. All known unit costs were evaluated equally for each of the options.

Phase IIIB: Review Progress of Value Engineering Study and Selected "Options"

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Specific assumptions follow:

- **Base Case** – Send drums from CWC to PEcoS for compaction and macro-encapsulation, then dispose at the Mixed Waste Disposal Unit.
 - Estimated number of shipments from CWC to PEcoS is 203 (8,100 55-gal drums in 85-gal overpacks at 40 drums per load).
 - Estimated number of shipments from PEcoS to the Mixed Waste Disposal Unit is 81 (8,100 drums compacted five each into 110-gal macro-encapsulation unit, making 1,620 units at 20 units per load).
 - PEcoS cost per package for compaction and macro-encapsulation of \$500 each was based on a rough-order-of-magnitude (ROM) cost estimate from PEcoS in March 2004.
- **Option 3** – Send MLLW debris in drums/overpacks from CWC to PEcoS for super-compaction before sending to ERDF for disposal and macro-encapsulation in ERDF.
 - Estimated number of shipments from CWC to PEcoS is 203 (8,100 55-gal drums in 85-gal overpacks at 40 drums per load.)
 - Estimated number of shipments from PEcoS to ERDF is 54 (8,100 packages compacted five into an 85-gal overpack, making 1,620 containers at 30 containers per load.) Overpack voids to be filled with sand by PEcoS.
 - PEcoS cost per package for compaction and macro-encapsulation of \$400 each was based on a ROM cost estimate from PEcoS in March 2004.
 - Mega pour pad costs are based on a Duratek cost proposal, Subcontract No. 0600X-SC-G0006, Change Notice No. 230, *Design and Construction of Mega Pour Pad*, dated May 20, 2003. Containers are assumed to be double-stacked.
- **Option 4** – Send MLLW debris in drums from CWC directly to a new super-compactor near ERDF for super-compaction, then disposal and macro-encapsulation in ERDF.
 - This option assumes FY04 super-compacting to be performed offsite at PEcoS (1,600 drums) in accordance with the method proposed in "Option 9." Super-compacting in FY05 and FY06 will be performed at new onsite facility (3,250 drums each year).
 - In FY04, the estimated number of shipments from CWC to PEcoS is 40. This assumes that all 1,600 of the 85-gal overpacks are transported as 40 per load.
 - In FY05 and FY06, the drums will remain onsite, and half of the remaining 6,500 drums are assumed to require overpacks for transport.

The site/location for new super-compactor is undetermined; therefore, utility costs are allowances only.

- Compactor would take 15 to 20 weeks for delivery, which includes 12 to 16 weeks of fabrication, 2 weeks of vendor testing and 1 to 2 weeks to crate and ship to Hanford.
- It is assumed that the new facility is contiguous with ERDF, therefore no further shipping costs are incurred after compacting operation.
- Building costs are shown as allowances only, as no design is available.
- Design costs at 10% of construction were used.
- HEPA filtration assumes 10 air changes per hour for the building, which is in addition to the super-compactor's integral HEPA filtration system.
- A 50% contingency was applied to the costs of the new facility and to the new facility's operation and maintenance personnel. At this preliminary design phase, several risky assumptions were made, most in regard to legal requirements and their effect on schedule and cost, and also the building and equipment.
- The auditable safety analysis cost was based on 6-month effort and assumes non-Category 3.
- Air permit cost assumes a non-Category 3 facility.
- The ERDF macro-encapsulation charge of \$65 is based on Duratek cost proposal.
- The new facility is assumed to be within 100 ft of existing available water and electric power.
- Costs are not included for facility demolition and disposal. These costs would include decontamination and/or fixation of building and equipment, building and equipment demolition, packaging, and final disposal costs.
- * **Option 5** – Send MLLW debris in drums from CWC directly to ERDF for disposal and macro-encapsulation within procured HICs placed in ERDF.
 - The estimated number of shipments from the Solid Waste Operations Complex (SWOC) to ERDF is 152. This assumes half of the drums (4,050) are overpacked into 85-gal overpacks and transported 40 per load, and the remainder (4,050 drums) are 55-gal drums and transported 80 per load.

Phase IIIB: Review Progress of Value Engineering Study and Selected "Options"

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- The \$12,000 cost per HIC to set the HICs, receive drums, remove overpacks, set drums and grout was based of a rough cost estimate provided by D.G. Saucedo to M. A. Casbon on April 6, 2004.
- A total of 20 drums would be disposed within each HIC.
- The \$8,000 HIC cost is a quote from Western Concrete in Spokane, Washington.
- *Option 6* – Send MLLW debris in drums from CWC directly to ERDF for disposal and macro-encapsulation within ERC-designed and constructed structural vault in ERDF.
 - This option assumes that FY04 super-compacting and macro-encapsulation will be performed offsite at PEcoS (1,600 drums) in accordance with the method proposed in "Option 9." The FY05 and FY06 macro-encapsulation will be performed at ERDF via the engineered structural monolith (3,250 drums per year).
 - In FY04, the estimated number of shipments from CWC to PEcoS is 40, assuming that the 1,600 55-gal overpacks are transported 40 per load.
 - In FY05 and FY06, the estimated number of shipments from SWOC to ERDF is 122. This assumes that half (3,250) are overpacked into 55-gal overpacks and transported 40 per load, and the remainder (3,250 drums) are 55-gal drums and transported 80 per load.
 - Duratek to stack drums four-high at ERDF.
 - Applied Geotechnical Engineering Consultants, Inc.'s (AGEC's) cost of \$285 per drum for treatment is for building forms and pouring grout and was pro-rated from \$50,000 quote for 176 drums.
 - A 20% contingency was added to AGEC's \$285 per drum cost because certain upgrades may be necessary in addition to the quoted price. These include additional analysis to extend the certified burial period from 300 years to 1,000 years, as well as increased burial depth from 60 ft to 100 ft. The revised specification may result in increased construction costs for the vaults.
 - FH will overpack half of the 55-gal drums and use overpacks four times each.
 - FH will ship packages from SWOC to ERDF.
 - The penalty cost for additional waste volume created by this method is deemed insignificant.
- *Option 9* – Send MLLW debris in drums from CWC to PEcoS for super-compaction and macro-encapsulation before sending to ERDF for disposal.

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- Estimated number of shipments from CWC to PEcoS is 203 (8,100 55-gal drums in 85-gal overpacks at 40 drums per load.)
- Estimated number of shipments from PEcoS to MWT is 81 (8,100 55-gal drums in 85-gal overpacks at 40 drums per load).
- PEcoS cost per package for compaction and macro-encapsulation of \$500 each was based on a ROM cost estimate from PEcoS in March 2004.
- *Option I* – Send MLLW debris in drums from CWC directly to ERDF, then grout-inject drums at ERDF using negative pressure before disposal and macro-encapsulation in ERDF.
 - The estimated number of shipments from SWOC to ERDF is 152. This assumes that half of the drums (4,050) are overpacked into 85-gal overpacks and transported 40 per load and the remaining 4,050 drums are 55-gal drums and transported 80 per load.
 - Mega pour pad costs are based on a Duratek cost proposal, Subcontract No. 0600X-SC-G0006, Change Notice No. 230, *Design and Construction of Mega Pour Pad*, dated May 20, 2003. Containers are assumed to be double-stacked.
 - This option was eliminated during Phase I of the VE study because of safety concerns. RL has asked that this option be revisited and that new features be incorporated (i.e., NucFils) that may address some of these safety issues.
 - Due to the lack of historical data for the condition and air-flow capacity of existing NucFils on the drums, an allowance of \$100 per new HEPA filter was used for the proposed method of grout filling the drums.
 - Further study will be necessary for this option based on the number of unknown factors associated with it.*
- *All Options* – Half of the drums shipped directly from SWOC to ERDF will require overpacks due to questionable structural integrity.
 - All drums being shipped offsite will be overpacked by FH and will be DOT-compliant.
 - Drums remaining onsite will need to meet treatment, storage, and disposal (TSD) compliance.
 - CERCLA document development includes engineering evaluation/cost analysis (EE/CA), data quality objective/sample analysis plan (DQO/SAP), and treatment plan. The costs are based on historical costs for similar scopes.
 - ERDF disposal costs are current and subject to change.

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- Project implementation management includes person in charge (PIC) lists, profiles, Onsite Waste Tracking Forms (OWTFs), and Solid Waste Information and Tracking System (SWITS) updates.
- All PEcoS compaction and treatment costs have been given a 15% contingency because of the uncertainties of the ROM estimate and the impact that an increased cost will have.
- All costs are in FY04 dollars and do not include escalation.

6.0 LIFECYCLE COST SUMMARY

The following represents a summary of lifecycle costs of "Base Case" and selected "Options":

Base Case: \$10.3 million

Cost estimate for sending drums from CWC to PEcoS for compaction and macro-encapsulation, then dispose at the Mixed Waste Disposal Unit.

Option 3: \$9.1 million

Cost estimate for sending the MLLW debris in drums/overpacks from CWC to PEcoS for super-compaction before sending to ERDF for disposal and macro-encapsulation.

Option 4: \$8.1 million

Cost estimate for sending the MLLW debris in drums from CWC directly to a new super-compactor near ERDF for super-compaction, then disposal and macro-encapsulation in ERDF.

Option 5: \$13.7 million

Cost estimate for sending the MLLW debris in drums from CWC directly to ERDF for disposal and macro-encapsulation within procured high-integrity containers placed in ERDF.

Option 6: \$7.3 million

Cost estimate for sending the MLLW debris in drums from CWC directly to ERDF for disposal and macro-encapsulation within ERC-designed and constructed structural vault in ERDF.

Option 9: \$9.9 million

Cost estimate for sending the MLLW debris in drums from CWC to PEcoS for super-compaction and macro-encapsulation before sending to ERDF for disposal.

Option 1: \$8.7 million

Cost estimate for sending the MLLW debris in drums from CWC directly to ERDF, then grout-inject drums at ERDF using negative pressure before disposal and macro-encapsulation in ERDF.

Details of estimated costs are shown in the following tables.

Table 6-1. Base Case – Cost Estimate for Sending Mixed Low-Level Waste Debris from CWC to PEcoS for Compaction and Macro, Then Dispose at the Mixed Waste Trench. (2 Pages)

Description	Qty	Unit	Unit Costs		Labor Hours		Wage	Subtotals			Additional Costs		Total	Annual Costs			
			Mat'l	Subcon.	Unit'	Total Hr		Mat'l	Labor	Subcon.	Subtotal	G&A		FY04	FY05	FY06	
CERCLA document development	1	hrs							140,000					140,000	140,000		
BTR to negotiate and issue PEcoS contract	1	ea			40	40	65		2,600					2,600	2,600		
Project implementation management	8,100	ea			0.6	4,860	65		315,900					315,900	63,180	126,360	
Waste Data Administrator	8,100	ea			0.2	1,620	50		81,000					81,000	16,200	32,400	
Overpack 55-gal packages at CWC																	
NCO 3 @ 0.75 MH ea.	8,100	ea			2.25	18,225	55		1,002,375					1,002,375	200,475	400,950	
RCT 2 @ 0.25 MH ea.	8,100	ea			0.5	4,050	55		222,750					222,750	44,550	89,100	
PIC 1 @ 0.25 MH ea.	8,100	ea			0.25	2,025	65		131,625					131,625	26,325	52,650	
Procure 55-gal overpacks (use four times)	2,025	ea	125						253,125					253,125	50,625	101,250	
Ship packages from CWC to PEcoS																	
NCO 3 @ 15 MH ea.	203	ea			48	9,744	55		535,920					535,920	107,180	214,368	
RCT 2 @ 8 MH ea.	203	ea			16	3,248	55		178,640					178,640	35,728	71,456	
Teamster 1 @ 4 hr	203	ea			4	812	50		40,680					40,680	8,120	16,240	
Shipper @ 24 MH ea.	203	ea			18	9,744	75		730,800					730,800	146,160	292,320	
PIC 1 @ 2 MH ea.	203	ea			2	406	65		26,390					26,390	5,278	10,556	
Contract transportation	203	ea		BDO						162,490					162,490	32,480	64,960
Contract G&A (@ 20%)	1	hrs												32,480	32,480	6,496	
PEcoS equipment and travel	8,100	ea		500						404,050					4,030,000	810,000	1,620,000
Contingency @ 15%														607,500	121,500	243,000	
Contract G&A (@ 20%)	1	hrs									931,500				931,500	186,300	372,600

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Table 6-1. Base Case – Cost Estimate for Sending Mixed Low-Level Waste Debris from CWC to PEcoS for Compaction and Macro, Then Dispose at the Mixed Waste Trench. (2 Pages)

Description	Qty	Unit	Unit Costs		Labor Hours	Wage	Subtotal		Additional Costs		Total	Annual Costs					
			Mat'l	Subcon.			Unit	Total Hr	\$/Hr	Mat'l	Labor	Subcon.	Subtotal	G&A	FY04	FY05	FY06
Treated waste return and disposal																	
WMR 1 @ 16 hr	81	ea			16	1,296	60			77,760			77,760	15,552	31,104	31,104	
TSDR 1 @ 8 hr	81	ea			8	648	60			38,880			38,880	7,776	15,552	15,552	
Ops reviews	81	ea			4	324	60			19,440			19,440	3,888	7,776	7,776	
Record Administrator	81	ea			2	162	50			8,100			8,100	1,620	3,240	3,240	
NCO 2 @ 8 MH/ea	81	ea			16	1,296	55			71,280			71,280	14,256	28,512	28,512	
RCT 2 @ 4 MH/ea	81	ea			8	648	55			35,640			35,640	7,128	14,256	14,256	
Ops PIC 1 @ 4 hr	81	ea			4	324	55			17,820			17,820	3,564	7,128	7,128	
Crane and rigging																	
Riggers 4 @ 8 MH/ea	81	ea			32	2,592	55			142,560			142,560	28,512	57,024	57,024	
Teamster 1 @ 8 hr	81	ea			8	648	50			32,400			32,400	6,480	12,960	12,960	
Crane Op 1 @ 3 hr	81	ea			8	648	55			35,640			35,640	7,128	14,256	14,256	
Supv 1 @ 4 hr	81	ea			4	324	60			19,440			19,440	3,888	7,776	7,776	
Contract transportation	81	ea	800							64,800			64,800	12,960	25,920	25,920	
Contract G&A (@ 20%)	1	l/s											12,960	12,960	2,592	5,184	5,184
TOTAL													10,022,325	2,118,545	3,951,890	3,951,890	

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Table 6-2. Base Case – Lifecycle and Net Present Worth Estimate.

LIFECYCLE AND NET PRESENT WORTH
Costs in \$1,000's

TOTAL NET PRESENT WORTH (\$1,000's)	\$10,022.3
TOTAL LIFE CYCLE (\$1,000's)	\$10,022.3

JANUARY 2000 REAL DISCOUNT RATES

3 YRS	1.6%
5 YRS	1.9%

NET PRESENT WORTH NOTES:

The 2.7% is the published escalation rate for FY03 by DOE for ER work found in document #072073 from Planning & Controls (for the purpose of this analysis assumed escalation for subsequent years remains unchanged). The real discount rates come from OMB Circular No. A-94 Appendix C, revised January 2003.
http://www.whitehouse.gov/omb/circulars/a094/a94_index.htm.

ONE-TIME COSTS AND RECURRING COST NOTES:

1. Costs include contingency.
2. Base costs are in 2002 dollars, fully burdened.
3. Costs are based on RCM estimate.
4. Duration provided by VE Team.

INTERPOLATED CALC PER NISTIR 6968, PAGE 13, NOTE 15
0 TO 3 YRS: HOW MANY YEARS IS THIS STUDY
3 TO 5 YEARS: HOW MANY YEARS IS THIS STUDY

INTERPOLATED REAL DISCOUNT RATE	
YES	0.00%
NO	0.00%

Interpolated Real Rate for Discounting % (Per OMB & NISTIR 6968) (OMB-01)
Inflation Rate % (DOE) for 100 Yrs. (62)

Rate
0.0%
2.7%

Compounding Value Factor @	1.027000
Escalated Interpolated Real Discount Rate $(1+r)^t \cdot (1+\epsilon)$	1.027000
Escalation $(1+\epsilon)$	1.027000

Count	Fiscal Year	Base Case	\$1,000's				\$1,000's	\$1,000's	
			Constant Dollars One-Time Costs (a)	Constant Dollars Recurring Costs (b)	Constant Dollars Total (Cash Flow) (c = a+b)	Compounded Escalation Factor @ 1.027 (d)			
0	2004	Send the MLLW debris from CWC to PLEoS for compaction and macro-encapsulation, then dispose at the Mixed Waste Trench	\$2,118.5		\$2,118.5	1.000	\$2,118.5	1,000000	\$2,118.5
1	2005	Send the MLLW debris from CWC to PLEoS for compaction and macro-encapsulation, then dispose at the Mixed Waste Trench	\$3,951.9		\$3,951.9	1.027	\$4,038.6	1,027000	\$3,951.9
2	2006	Send the MLLW debris from CWC to PLEoS for compaction and macro-encapsulation, then dispose at the Mixed Waste Trench	\$3,951.9		\$3,951.9	1.055	\$4,168.2	1,054729	\$3,951.9
Total			\$10,022.3		\$10,022.3		\$10,345.3		\$10,022.3

**Table 6-3. Option 3 – Cost Estimate for Sending the MLLW Debris from
CWC to PEcoS for Compaction, Then Macro and Dispose at ERDF. (2 Pages)**

Description	Qty	Unit	Unit Costs		Labor Hours	Wage	Subtotals			Total	Annual Costs						
			Mkt'l	Subcon.			Unit Hr	Total Hr	\$/hr		Mkt'l	Labor	Subcon.	FY04	FY05	FY06	
CERCLA document development (PH)	1	hrs								140,000			140,000	140,000	140,000		
ETR to negotiate and issue PEcoS contract (PH)	1	ea			40	40	65			2,600			2,600	2,600	2,600		
Project implementation management (PH)	8,100	ea			0.6	4,860	65			315,900			315,900	63,180	126,360	126,360	
Waste Data Administrator (PH)	8,100	ea			0.2	1,620	50			\$1,060			81,060	16,200	32,400	32,400	
Overpack 55-gal packages at CWC (PH)																	
NCO 3 @ 0.75 MH ea.	8,100	ea			2.3	18,225	55			1,002,375			1,002,375	200,475	400,950	400,950	
RCT 2 @ 0.25 MH ea.	8,100	ea			0.5	4,050	55			222,750			222,750	44,530	89,100	89,100	
PIC 1 @ 2.25 MH ea.	8,100	ea			0.3	2,025	65			131,625			131,625	26,325	52,650	52,650	
Procure 85-gal overpacks (use two times)	4,050	ea	125							506,250			506,250	101,250	202,500	202,500	
Ship packages from CWC to PEcoS (PH)																	
NCO 3 @ 16 MH ea.	203	ea			48	9,744	55			535,920			535,920	107,184	214,368	214,368	
RCT 2 @ 8 MH ea.	203	ea			16	3,248	55			178,640			178,640	35,728	71,456	71,456	
Teamster 1 @ 4 hr.	203	ea			4	812	50			40,600			40,600	8,120	16,240	16,240	
Shipper 2 @ 24 MH ea.	203	ea			48	9,744	75			730,800			730,800	146,160	292,320	292,320	
PIC 1 @ 2.2 MH ea.	203	ea			2	406	65			26,390			26,390	5,278	10,556	10,556	
Contract transportation	203	ea		800							162,400			162,400	32,480	64,960	64,960
Contract G&A @ 20% (PH)	1	1/2												32,480	6,496	12,992	12,992
PEcoS compact and treat	8,100	ea		400							3,240,000			3,240,000	648,000	1,296,000	1,296,000
Contingency @ 15%														486,000	97,200	194,400	194,400
Contract G&A @ 20% (PH)	1	1/2									245,200			245,200	49,040	98,080	98,080

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**Table 6-3. Option 3 – Cost Estimate for Sending the MLLW Debris from
CWC to PEcoS for Compaction, Then Macro and Dispose at ERDF. (2 Pages)**

Description	Qty	Unit	Unit Costs		Labor Hours		Wage	Subtotals			Total	Annual Costs			
			Mat'l	Subcon.	Unit Hr	Total Hr		Mat'l	Labor	Subcon.		FY04	FY05	FY06	
Ship packages from PEcoS to ERDF															
Contract transportation	34	ea.		800							43,200	43,200	8,640	17,280	17,280
Contract G&A @ 20% (FID)	1	f/s									8,640	1,728	3,456	3,456	3,456
Disposal at ERDF															
ERDF macro-encapsulation charge per drum (83 gal) (GHD)	1,620	ea.		65							105,300	21,060	42,120	42,120	42,120
ERDF disposal charge per ton	972	ton		33							32,076	6,415.2	12,830.4	12,830.4	12,830.4
Contract G&A @ 25% (GHD)	1	f/s									24,344	6,868.8	13,737.6	13,737.6	13,737.6
TOTAL:											8,804,390	1,874,976	3,464,756	3,464,756	3,464,756

Table 6-4. Option 3 – Lifecycle and Net Present Worth Estimate.

LIFECYCLE AND NET PRESENT WORTH

Costs in \$1,000's

TOTAL NET PRESENT WORTH (\$1,000's) \$8,804.6

TOTAL LIFE CYCLE (\$1,000's) \$8,804.6

JANUARY 2000 REAL DISCOUNT RATES

3 YRS	1.6%
5 YRS	1.9%

NET PRESENT WORTH NOTES:

The 2.7% is the published escalation rate for FY03 by DOE for ER work found in document #077073 from Planning & Controls (for the purpose of this analysis assumed escalation for subsequent years remains unchanged). The real discount rates come from OMB Circular No. A-94 Appendix C, revised January 2003.
http://www.whitehouse.gov/omb/circulars/a94/a94_cappx.htm.

ONE-TIME COSTS AND RECURRING COST NOTES:

1. Costs include contingency.
2. Base costs are in 2002 dollars, fully burdened.
3. Costs are based on a ROM estimate.
4. Duration provided by VE Team.

INTERPOLATED CALC PER NISTIR 6968, PAGE 13, NOTE 15.

0 TO 3 YRS: HOW MANY YEARS IS THIS STUDY

3 TO 5 YEARS: HOW MANY YEARS IS THIS STUDY

YRS	INTERPOLATED REAL DISCOUNT RATE
0	0.00%
0	0.00%

Compounding Value Factor (d)	Compounding Value Factor (d)
1.027000	1.027000
1.027000	1.027000

Interpolated Real Rate for Discounting % (Per OMB & NISTIR 6968) (OMB) (r1)
 Inflation Rate % (DOE) for 100 Yrs (r2)

Rate (1+r1)/(1+r2)
 Escalated Interpolated Real Discount Rate (1+r1)/(1+r2)
 Escalation: (1+r2)

Count	Fiscal Year	Option #3	\$1,000's			Compounded Escalation Factor @ 1.027 (d)	Lifecycle Costs (\$ = e^d) (e = n/b)	Compounded @ Escalated Discount Factor @ 1.027 (d)	\$1,000's
			Constant Dollars One-Time Costs (a)	Constant Dollars Recurring Costs (b)	Constant Dollars Total (Cash Flow) (c = a+b)				
0	2004	Send the MLLW debris from CWC to PEcoS for compaction, then macro-encapsulation and dispose at ERDF	\$1,875.0		\$1,875.0	1.000	\$1,875.0	1.000000	\$1,875.0
1	2005	Send the MLLW debris from CWC to PEcoS for compaction, then macro-encapsulate and dispose at ERDF	\$3,464.8		\$3,464.8	1.027	\$3,558.3	1.027000	\$3,464.8
2	2006	Send the MLLW debris from CWC to PEcoS for compaction, then macro-encapsulate and dispose at ERDF	\$3,464.8		\$3,464.8	1.055	\$3,654.4	1.054729	\$3,464.8
Total:			\$8,804.6		\$8,804.6		\$9,087.9		\$8,804.6

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Table 6-5. Option 4 – Cost Estimate for Sending the Mixed-Level Waste Debris from CWC to a New Onsite Compactor, Then Macro-Encapsulate and Dispose at ERDF. (5 Pages)

Description	Qty	Unit	Unit Costs		Labor Hours		Wage	Subtotals			Subtotal	Total	Annual Costs		
			Mat'l	Subcon	Unit Hr	Total Hr		Mat'l	Labor	Subcon			FY04	FY05	FY06
FY04															
CERCLA document development (FH)	1	1/s							140,000			140,000	140,000		
BTR to negotiate and issue PEcos contract (FH)	1	ea			40	40	65		2,600			2,600	2,600		
Project implementation management (FH)	1,600	ea			0.6	960	65		62,400			62,400	62,400		
Waste Data Administrator (FH)	1,600	ea			0.2	320	50		16,000			16,000	16,000		
Overpack 55-gal packages at CWC (FH)															
NCO 3 @ 0.75 MH ea.	1,600	ea			2.25	3,600	55		198,000			198,000	198,000		
RCT 2 @ 0.25 MH ea.	1,600	ea			0.5	800	55		44,000			44,000	44,000		
PIC 1 @ 0.25 MH ea.	1,600	ea			0.25	400	65		26,000			26,000	26,000		
Procure 25-gal overpacks (FH) (use four times)	400	ea	125						50,000			50,000	50,000		
Ship packages from CWC to PEcos (FH)															
NCO 3 @ 16 MPH ea.	40	ea			48	1,920	55		105,600			105,600	105,600		
RCT 2 @ 8 MPH ea.	40	ea			16	640	55		35,200			35,200	35,200		
Teamster 1 @ 4 hr	40	ea			4	160	50		8,000			8,000	8,000		
Shipper @ 24 MPH ea.	40	ea			48	1,920	75		144,000			144,000	144,000		
PIC 1 @ 2 MPH ea.	40	ea			2	80	65		5,200			5,200	5,200		
Contract transportation (FH)	40	ea			800					32,000		32,000	32,000		
Contract Q/A @ 20%	1	1/s										6,400	6,400		
PEcos compact and test (FH)	1,600	ea			500					800,000		800,000	800,000		
Contingency @ 15%												120,000	120,000		
Contract Q/A @ 20%	1	1/s										16,000	16,000		

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Table 6-5. Option 4 – Cost Estimate for Sending the Mixed-Level Waste Debris from CWC to a New Onsite Compactor, Then Macro-Encapsulate and Dispose at ERDF. (5 Pages)

Description	Qty	Unit	Unit Costs		Labor Hours		Wage \$/Hr	Subtotals			Total	Annual Costs		
			Mat'l	Subcon.	Unit Hr	Total Hr		Mat'l	Labor	Subcon.		FY04	FY05	FY06
Contract transportation, ship packages from FHC/S to ERDF (PH)	16	ton		800							12,800	12,800	12,800	
Contract Q&A @ 20%	1	1/2									2,560	2,560	2,560	
Disposal at ERDF (BII)														
ERDF disposal charge per ton	298	ton			33						9,504	9,504	9,504	
Contract Q&A @ 25%	1	1/2									2,376	2,376	2,376	
Subtotal FY04 Operational Costs											2,006,640			
BII to Furnish Onsite Compacting Facility (FY04)														
Procure compactor as quoted by Ken at Container Products Corp (910) 392-6190	1	ea	250,000					250,000			250,000	250,000	250,000	
Spare parts allowance	1	1/2	25,000					25,000			25,000	25,000	25,000	
Shipping from NC (25,000 lb)	1	1/2	10,000					10,000			10,000	10,000	10,000	
Installation of compactor, allow 7 mon, 5 days	1	1/2	5,000			280	55	5,000	15,400		20,400	20,400	20,400	
Metal building, allow for 60 x 72 x 25' height	4,500	sf		50							225,000	225,000	225,000	
Fire protection	4,500	sf		4							18,000	18,000	18,000	
Allowance for air locks and roll-up doors	1	1/2	50,000								50,000	50,000	50,000	
Allowance for portal monitor and hand-held radiation monitors	1	1/2	20,000								20,000	20,000	20,000	
Allowance for emergency back-up power	1	1/2	25,000								25,000	25,000	25,000	

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**Table 6-5. Option 4 – Cost Estimate for Sending the Mixed-Level Waste Debris from CWC to a
New Onsite Compactor, Then Macro-Encapsulate and Dispose at ERDF. (5 Pages)**

Description	Qty	Unit	Unit Costs		Labor Hours		Wage \$/Hr	Subtotals			Subtotal	Total	Annual Costs		
			Mat'l	Subcon.	Unit Hr	Total Hr		Mat'l	Labor	Subcon.			FY04	FY05	FY06
Utilities															
Bring in water (allowance)	1	l/s		10,000						10,000		10,000	10,000		
Bring in electric power (allowance)	1	l/s		10,000						10,000		10,000	10,000		
Drain field (allowance)	1	l/s		25,000						25,000		25,000	25,000		
Contaminated rinsate holding tank and decontamination facilities (allowance)	1	l/s		20,000						20,000		20,000	20,000		
Allowance for site survey	1	ea		1,500						1,500		1,500	1,500		
Change trailer/lunch room/officer rental, 10 ft by 50 ft	24	mp		350						8,400		8,400	8,400		
HEPA filtration assumed 10 air changes per hour volume = 75 x 60 x 25 ft = 112,500 cu ft x 10 = 1,125,000 1,125,000/60 = 18,750 cfm	18,750	cfa		20						362,500		362,500	362,500		
Allowance for design @ 10%	1	l/s										97,540	97,540		
ASA costs, allow 6 months mid-\$80,000 (per R. Carlson) assume Non-Category 3	1	l/s								80,000		80,000	80,000		
Start-up testing, allowance for crew of 8 for 2 weeks	1	l/s		630	640	65				35,200		35,200	35,200		
Air permit (per R. Pelet)	1	l/s								100,000		100,000	100,000		
G&A @ 25% (JHI)	1	l/s										398,385	398,385		
Contingency @ 50%												995,963	995,963		
Salient New Compacting Facility															
FY05 and FY06															
CERCLA document development (JHI)	1	l/s								140,000		140,000	140,000		

Phase II B: Review Progress of

Value Engineering Study and Selected "Options"

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Table 6-5. Option 4 – Cost Estimate for Sending the Mixed-Level Waste Debris from CWC to a New Onsite Compactor, Then Macro-Encapsulate and Dispose at ERDF. (5 Pages)

Description	Qty	Unit	Unit Costs		Labor Hours		Wage	Subtotal			Subtotal	Total	Annual Costs		
			Mat'l	Subcon	Unit Hr.	Total Hr.		S/Hr	Mat'l	Subcon			FY04	FY05	FY06
Project implementation management (PH)	6,500	ea			0.6	3,900	65		253,500			253,500		126,750	126,750
Waste Data Administrator (FID)	6,500	ea			0.2	1,300	50		65,000			65,000		32,500	32,500
Building maintenance: 4 hr/day for 2 years (BH)	1	1/2				2,080	55		114,400			114,400		57,200	57,200
VA (BH)	6,500	ea			0.2	1,300	60		78,000			78,000		39,000	39,000
Contingency of 50% for above two BH personnel	1	1/2										96,200		48,100	48,100
Overpack: 55-gal drums at CWC (FH); assume one-half will require overpacks															
NCO 3 @ 0.75 MH ea.	3,250	ea			2.25	7,313	55		402,188			402,188		201,093.8	201,093.8
RCT 2 @ 0.25 MH ea.	3,250	ea			0.4	1,625	55		89,375			89,375		44,687.5	44,687.5
PIC 1 @ 0.25 MH ea.	3,250	ea			0.25	813	65		52,813			52,813		26,406.25	26,406.25
Propane 85-gal overpacks (use 4 times)	813	ea	125						101,625			101,625		50,812.5	50,812.5
Ship packages from CWC to new facility (FH)															
NCO 3 @ 8 MH ea.	61	ea			24	1,464	55		80,520			80,520		40,260	40,260
RCT 1 @ 8 MH ea.	61	ea			8	488	55		26,840			26,840		13,420	13,420
Transuster 1 @ 8 MH	61	ea			8	488	50		24,400			24,400		12,200	12,200
Shredder 1 @ 16 MH ea.	61	ea			16	976	75		73,200			73,200		36,600	36,600
PIC 1 @ 4 MH ea.	61	ea			4	244	65		15,860			15,860		7,930	7,930
Contract transportation (prioritized)	1	1/2			160,500							160,500		80,250	80,250
Contract GWA (@ 20% (FH))	1	1/2										32,100		16,050	16,050
Remove drums from overpacks, based on current 183-#1 work (Dunstek)															
1 Labster	3,250	ea			0.2	650	50		32,500			32,500		16,250	16,250
1 HEO	3,250	ea			0.2	650	55		35,750			35,750		17,875	17,875
1 RCT	3,250	ea			0.2	650	50		32,500			32,500		16,250	16,250
Compact drums and package into overpacks. Assume output of 40 drums per day. (Dunstek)															

Phase II B: Review Progress of
Value Engineering Study and Selected "Options"

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VE Study Report for Treatment and Disposal of the MLLW Retrieved From Burial Ground 218-B-EC

June 2004

Table 6-3. Option 4 – Cost Estimate for Sending the Mixed-Level Waste Debris from CWC to a New Onsite Compactor, Then Macro-Encapsulate and Dispose at ERDF. (5 Pages)

Description	Qty	Unit	Unit Costs		Labor Hours		Wage	Subtotals			Subtotal	Total	Annual Costs			
			Mat'l	Subcon	Unit Hr.	Total Hr.		Mat'l	Subcon	Subcon			FY04	FY05	FY06	
Forklift operator, 1 ea.	6,500	ea			0.2	1,300	\$0	65,000			65,000		32,500	32,500	32,500	
Laborers, 2 ea.	6,500	ea			0.4	2,600	\$0	130,000			130,000		65,000	65,000	65,000	
RCT, 1 ea.	6,500	ea			0.2	1,300	\$0	65,000			65,000		32,500	32,500	32,500	
Equipment rental (Duratek)																
Forklift, 3000#	24	mo			1,500						36,000		18,000	18,000	18,000	
Truck mounted hydraulic lift, 12 ton	24	mo			4,050						97,200		48,600	48,600	48,600	
Scissor lift, 1000#, 15H	24	mo			750						18,000		9,000	9,000	9,000	
Duratek G&P, B&O @ 16%												81,912		40,956	40,956	40,956
Contingency of 50% for compacting operation	1	1/s										245,556		123,278	123,278	123,278
ERDF macro-encapsulation charge per drum (85 gal) (BHL)	1,300	ea			65						84,500		42,250	42,250	42,250	
ERDF disposal (BHL)	1,170	ton			33						38,610		19,305	19,305	19,305	
Contract G&A @ 25% (BHL) apply to drum removal from overpacks, compacting, packaging and disposal	1	1/s										240,882		120,441	120,441	120,441
Subtotal FY05 and FY06											3,010,930					
TOTAL												8,005,459	4,994,528	1,575,465	1,435,465	

**Phase IIIB: Review Progress of
Value Engineering Study and Selected "Options"**

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Table 6-6. Option 4 – Lifecycle and Net Present Worth Estimate.

LIFECYCLE AND NET PRESENT WORTH
Costs in \$1,000's

TOTAL NET PRESENT WORTH (\$1,000's)	\$8,005.5
TOTAL LIFE CYCLE (\$1,000's)	\$8,005.5

JANUARY 2000 REAL DISCOUNT RATES

3 YRS	1.6%
5 YRS	1.0%

NET PRESENT WORTH NOTES:

The 2.7% is the published escalation rate for FY03 by DOE for ER work found in document #077073 from Planning & Controls (for the purpose of this analysis assumed escalation for subsequent years remains unchanged). The real discount rates come from OMB Circular No. A-94 Appendix C, revised January 2003: (http://www.whitehouse.gov/omb/circulars/a024/a94_appx-c.html).

ONE-TIME COSTS AND RECURRING COSTS NOTES:

5. Costs include contingency.
6. Base costs are in 2002 dollars, fully burdened.
7. Costs are based on a ROM estimate.
8. Duration provided by VE Team.

INTERPOLATED CALC PER NISTIR 6968, PAGE 13, NOTE 15
0 TO 3 YRS: HOW MANY YEARS IS THIS STUDY
3 TO 5 YEARS: HOW MANY YEARS IS THIS STUDY

YRS	INTERPOLATED REAL DISCOUNT RATE
0	0.0%
0	0.0%

Interpolated Real Rate for Discounting % (Per OMB & NISTIR 6968) (OMB) (1)
Inflation Rate % (DCE) for 100 Yrs. (2)

Rate	Compounding Value
0.0%	Factor @ 1.027000
2.7%	Escalation (1+r2)

Escalated Interpolated Real Discount Rate $(1+r1)^n(1+r2)$

Count	Fiscal Year	Option #4	\$1,000's	\$1,000's	\$1,000's	\$1,000's			
			Constant Dollars One-Time Costs (a)	Constant Dollars Recurring Costs (b)	Constant Dollars Total (Cash Flow) (c = a+b)	Compounded Escalation Factor @ 1.027 (d) (e = a+b)	Lifecycle Costs (\$1,000's) (g = e*d)	Compounded @ Escalated Discount Factor @ 1.027 (f)	Net Present Worth (\$1,000's) (h = g*f)
0	2004	Send the mixed-level waste debris from CWC to a new onsite compactor, then macro-encapsulate and dispose at ERDF	\$4,994.5		\$4,994.5	1.000	\$4,994.5	1.000000	\$4,994.5
1	2005	Send the mixed-level waste debris from CWC to a new onsite compactor, then macro-encapsulate and dispose at ERDF	\$1,575.5		\$1,575.5	1.027	\$1,618.0	1.027000	\$1,575.5
2	2006	Send the mixed-level waste debris from CWC to a new onsite compactor, then macro-encapsulate and dispose at ERDF	\$1,435.5		\$1,435.5	1.055	\$1,514.1	1.054720	\$1,435.5
	Total		\$8,005.5		\$8,005.5		\$8,126.6		\$8,005.5

Phase IIIB: Review Progress of
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Table 6-7. Option 5 – Cost Estimate for Sending the Mixed Low-Level Waste Debris Directly to ERDF for Macro via Procured Engineered Vault. (2 Pages)

Description	Qty.	Unit	Unit Costs		Labor Hours		Wage \$/hr	Subtotals			Total	Annual Costs		
			Mat'l	Subcon.	Unit hr	Total hr		Mat'l	Subcon.			FY04	FY05	FY06
CERCLA document development (FH)	1	ea							140,000		140,000	140,000	140,000	
Project implementation management (FH)	8,100	ea			0.6	4,860	63		315,900		315,900	63,180	126,360	126,360
Waste Data Administrator (FH)	8,100	ea			0.2	1,620	36		81,000		81,000	16,200	32,400	32,400
Overpack 55-gal packages at CWC (FH)														
NCO 3 @ 0.75 MH ea.	4,050	ea			2.25	9,135	55	301,188		301,188	109,237.5	200,475	200,475	
RCT 2 @ 0.25 MH ea.	4,050	ea			0.5	2,025	55	111,375		111,375	22,375	44,550	44,550	
PIC 1 @ 0.25 MH ea.	4,050	ea			0.25	1,013	65	65,813		65,813	13,162.5	26,325	26,325	
Procure 85-gal overpacks (FH) (use four times)	1,013	ea	125					126,625		126,625	25,325	50,650	50,650	
Ship packages from SWOC to ERDF (FH)														
NCO 3 @ 8 MH ea.	152	ea			24	3,648	55	200,640		200,640	40,128	80,256	80,256	
RCT 1 @ 8 MH	152	ea			8	1,216	55	60,380		60,380	13,370	26,752	26,752	
Teamster 1 @ 8 MH	152	ea			3	1,216	50	60,800		60,800	12,160	24,320	24,320	
Shipper 1 @ 16 MH ea.	152	ea			16	2,432	75	182,400		182,400	36,480	72,960	72,960	
PIC 1 @ 4 MH ea.	152	ea			4	668	65	39,320		39,320	7,804	15,808	15,808	
Contract transportation (FH)	1	ea	200,000						200,000	200,000	40,000	80,000	80,000	
Contract G&A (@ 20%)	1	ea								40,000	8,000	16,000	16,000	
ERDF treatment and disposal (Duratek)														
Set HICs, receive drums, remove overpacks, set 20 drums, grant HIC by three phases, place lid	465	ea	12,000						4,860,000	4,860,000	972,000	1,944,000	1,944,000	

Phase IIIB: Review Progress of
Value Engineering Study and Selected "Options"

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Description	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Annual Costs
Dustcart OH&P, B2O @ 16%	1	1/5										772,600
Propane HCl, 7.4 liter by 8 hr dissolved, For Treatment	405	ea	8,060									155,520
20 drums HCl = 105 ea. (G11)												311,010
Audioblast Sabrex Sandgistics (G11)	1	1/5										311,010
Dustcart disposal fees (G11)	810	100										2,080
Comcast GEA @ 23% (G11)	1	1/5										10,692
TOTAL												890,953

Table 6-7. Option 5 - Cost Estimate for Sending the Mixed Low-Level Waste Debris Directly to ERDF
for Mixing via Premixed Intermediate Vans (2 Pages)

**Phase II.B: Review Progress of
Value Engineering Study and Selected "Options"**

BRI-01735
Rev. 0

VE Study Report for Treatment and Disposal of the MLLW. Revised from Bushland 218 Rev 4C
June 2004

TOTAL NET PRESENT WORTH (\$1,000's)	\$13,269.0
TOTAL LIFE CYCLE (\$1,000's)	\$13,269.0

LIFECYCLE AND NET PRESENT WORTH
Costs in \$1,000's

JANUARY 2000 REAL DISCOUNT RATES

3 YRS.	1.6%
5 YRS	1.9%

NET PRESENT WORTH NOTES:

The 2.7% is the published escalation rate for FY03 by DOD for ER work found in document #077073 from Planning & Controls (for the purpose of this analysis assumed escalation for subsequent years remains unchanged). The real discount rates come from OMB Circular No. A-94 Appendix C, revised January 2003.
http://www.whitehouse.gov/omb/circulars/a024/a04_aops-c.html

ONE-TIME COSTS AND RECURRING COST NOTES:

9. Costs include contingency.
10. Base costs are in 2002 dollars, fully burdened.
11. Costs are based on a ROM estimate.
12. Duration provided by VE Team.

INTERPOLATION CALC PER NISTIR 6968, PAGE 13, NOTE 15
0 TO 3 YRS: HOW MANY YEARS IS THIS STUDY
3 TO 5 YEARS: HOW MANY YEARS IS THIS STUDY

INTERPOLATED REAL DISCOUNT RATE	
YES	NO
0	0.00%
0	0.00%

Interpolated Real Rate for Discounting % (Per OMB & NISTIR 6968) (OMB) (r1)
Inflation Rate % (DOD) for 100 Yrs. (r2)

Rate:	Compounding Value:
0.0%	Factor @ 1.027000
2.7%	Escalation (1+r2)
	1.027000

$$\text{Escalated Interpolated Real Discount Rate } (1+r1) * (1+r2)$$

Count	Fiscal Year	Option #5	\$1,000's			Compounded Escalation Factor @ 1.027 (d)	\$1,000's	\$1,000's
			Constant Dollars One-Time Costs (a)	Constant Dollars Recurring Costs (b)	Constant Dollars Total (Cash Flow) (c = a+b)			
0	2004	Send the MLLW debris directly to ERDF for micro-encapsulation via procured engineered vault	\$2,765.8		\$2,765.8	1.000	\$2,765.8	1,000.000
1	2005	Send the MLLW debris directly to ERDF for macro-encapsulation via procured engineered vault	\$5,251.6		\$5,251.6	1.027	\$5,393.4	1,027.000
2	2006	Send the MLLW debris directly to ERDF for macro-encapsulation via procured engineered vault	\$5,251.6		\$5,251.6	1.055	\$5,539.0	1,054.729
Total			\$13,269.0		\$13,269.0		\$13,698.2	\$13,269.0

**Phase IIIB: Review Progress of
Value Engineering Study and Selected "Options"**

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**Table 6-9. Option 6 – Cost Estimate for Sending Mixed Low-Level Waste Debris Directly to ERDF
for Macro via Engineered Structural Monolith. (3 Pages)**

Description	Qty	Unit	Unit Costs		Labor Hours		Wage \$/hr	Subtotals			Additional Costs			Total	Annual Costs		
			Mat'l	Subcon.	Unit Hr	Total Hr		Mat'l	Labor	Subcon.	Subtotal	G&A	Conting.		FY04	FY05	FY06
FY04																	
CERCLA document development (PH)	1	hrs						140,000						140,000	140,000		
BTR to negotiate and issue PECoS contract (FY04)	1	ea			40	40	65		2,600					2,600	2,600		
Project implementation management (PH)	1,600	ea			0.6	960	65		62,400					62,400	62,400		
Waste Data Administrator (PH) overpack 55-gal packages at CWC (PH)	1,600	ea			0.2	320	50		16,000					16,000	16,000		
NCO 3 @ 0.75 MH ea.	1,600	ea			2.3	3,600	55		198,000					198,000	198,000		
RCT 2 @ 0.25 MH ea.	1,600	ea			0.5	800	55		44,000					44,000	44,000		
PIC 1 @ 0.25 MH ea.	1,600	ea			0.3	400	65		26,000					26,000	26,000		
Procure 85-gal overpacks (PH) (use four times)	400	ea	125					50,000					50,000	50,000			
Ship packages from CWC to PECoS (FY04)																	
NCO 3 @ 16 MH ea.	40	ea			48	1,920	55		105,600					105,600	105,600		
RCT 2 @ 8 MH ea.	40	ea			10	640	55		35,200					35,200	35,200		
Teamster 1 @ 4 hr	40	ea			4	160	50		8,000					8,000	8,000		
Shipper 1 @ 24 MH ea.	40	ea			38	1,920	75		144,000					144,000	144,000		
PIC 1 @ 2 MH ea.	40	ea			2	80	65		5,200					5,200	5,200		
Contract transportation (PH)	40	ea			300					32,000				32,000	32,000		
Contract G&A @ 20%	1	hrs									6,400			6,400	6,400		
PECoS cleanup and treat (FY04)	1,600	ea			560				800,000					800,000	800,000		
Contingency @ 15%												120,000		120,000	120,000		
Contract G&A @ 20%	1	hrs									184,000			184,000	184,000		
Contract transportation, ship packages from PECoS to ERDF (FY04)	16	ea			800				32,800					32,800	32,800		

Phase IIIB: Review Progress of Value Engineering Study and Selected "Options"

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Table 6-9. Option 6 – Cost Estimate for Sending Mixed Low-Level Waste Debris Directly to ERDF for Macro via Engineered Structural Monolith. (3 Pages)

Description	Qty	Unit	Unit Costs		Labor Hours		Wage		Subtotals			Additional Costs			Total	Annual Costs		
			Mat'l	Subcon.	Unit Hr	Total Hr	\$/Hr	Mat'l	Labor	Subcon.	Subtotal	G&A	Conting.	FY04	FY05	FY06		
Contract G&A (@ 20% (FBI))	1	1/s									2,560			2,560	2,560	2,560		
Disposal at ERDF (BH)																		
ERDF disposal charge per ton	280	ton			33						9,504			9,504	9,504	9,504		
Contract G&A (@ 25% (FBI))	1	1/s									2,376			2,376	2,376	2,376		
Subtotal FY04 Operational Costs											2,906,640							
FY03 and FY05																		
Project implementation management (FBI)	6,500	ea			0.6	3,900	65		253,500					253,500		126,750	126,750	
Waste Data Administrator (FBI)	6,500	ea			0.2	1,300	50		65,000					65,000		32,500	32,500	
Overpack 55-gal packages at CWC (FBI)																		
NCO 3 @ 0.75 MH ea.	3,250	ea			2.3	7,313	55		402,183					402,183		201,093.8	201,094	
RCT 2 @ 0.25 MH ea.	3,250	ea			0.5	1,625	55		89,375					89,375		44,687.5	44,688	
PIC 1 @ 0.25 MH ea.	3,250	ea			0.3	813	65		52,813					52,813		26,406.25	26,406	
Procure 55-gal overpacks (use four times)	813	ea	125					101,625						101,625		508,12.5	50,813	
Ship packages from SWOC to ERDF (FBI)																		
NCO 3 @ 8 MH ea.	122	ea			24	2,928	55		161,040					161,040		80,520	80,520	
RCT 1 @ 8 MH	122	ea			6	976	55		53,680					53,680		26,840	26,840	
Teamster 1 @ 8 MH	122	ea			8	976	50		48,800					48,800		24,400	24,400	
Shipper 1 @ 16 MH ea.	122	ea			16	1,952	75		146,400					146,400		73,200	73,200	
PIC 1 @ 4 MH ea.	122	ea			4	488	65		31,720					31,720		15,860	15,860	
Contract transportation	1	1/s	200,000						200,000					200,000		100,000	100,000	
Contract G&A (@ 20% (FBI))	1	1/s									40,000			40,000		20,000	20,000	

**Phase II B: Review Progress of
Value Engineering Study and Selected "Options"**

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**Table 6-9. Option 6 – Cost Estimate for Sending Mixed Low-Level Waste Debris Directly to ERDF
for Macro via Engineered Structural Monolith. (3 Pages)**

Description	Qty	Unit	Unit Costs		Labor Hours		Wage	Subtotals			Additional Costs			Total	Annual Costs				
			Mat'l	Subcon.	Unit Hr	Total Hr		S/Hr	Mat'l	Labor	Subcon.	Subtotal	G&A	Conting	FY04	FY05	FY06		
<i>Assume one-half (3,250 ea.) of arriving drums are overpacked. Remove drums from overpacks. Based on current 183-H work (per J. James) 20 drum batches require 4 hours or 0.2 MHH ea. (Duratek)</i>																			
1 Laborer	3,250	ea			0.2	650	\$6		32,500						32,500		16,250	16,250	
1 HEO	3,250	ea			0.2	650	\$5		35,750						35,750		17,875	17,875	
1 RCT	3,250	ea			0.2	650	\$5		35,750						35,750		17,875	17,875	
<i>ERDF labor and support, stack drums four-high (Duratek)</i>																			
1 Laborer	6,500	ea			0.2	1,300	\$6		65,000						65,000		32,500	32,500	
1 HEO	6,500	ea			0.2	1,300	\$5		71,500						71,500		35,750	35,750	
1 RCT	6,500	ea			0.2	1,300	\$5		71,500						71,500		35,750	35,750	
<i>Equipment rental (Duratek)</i>																			
Forklift, 3,000#	24	mo			1,500							36,000			36,000		18,000	18,000	
Truck mounted hydraulic lift, 12 ton	24	mo			4,030							97,200			97,200		48,600	48,600	
Schisser lift, 1,000#, 13' H	24	mo			750							18,000			18,000		9,000	9,000	
Duratek OH&P, B&O @ 16%															74,112		37,056	37,056	
ERDF treatment - build forms and grout (AGEC)	6,500	ea			2.85							212,06			1,852,500		926,250	926,250	
Contingency of 20% added to above AGEC quote for upgrades	6,500	ea													370,500		185,250	185,250	
ERDF disposal cost (BHI)	650	ton			33							21,450			21,450		10,725	10,725	
Management of change for auditable safety analysis (BHI)	1	1/8					\$6	\$6	65		5,200				5,200		2,600	2,600	
Contract G&A @ 25% (BHI)	1	1/8													695,741		348,370.3	348,370	
Subtotal FY05 and FY06 Operational Costs												5,129,843							
TOTAL															7,136,483	2,006,640	2,564,921	2,564,921	

**Phase IIb: Review Progress of
Value Engineering Study and Selected "Options"**

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Table 6-10. Option 6 - Lifecycle and Net Present Worth Estimate.

LIFECYCLE AND NET PRESENT WORTH
Costs in \$1,000's.

TOTAL NET PRESENT WORTH (\$1,000's)	\$7,136.4
TOTAL LIFE CYCLE (\$1,000's)	\$7,136.4

JANUARY 2000 REAL DISCOUNT RATES

3 YRS	1.6%
5 YRS	1.9%

NET PRESENT WORTH NOTES:

The 2.1% is the published escalation rate for FY03 by DOE for ER work found in document #077073 from Planning & Controls (for the purpose of this analysis assumed escalation for subsequent years remains unchanged). The real discount rates come from OMB Circular No. A-94 Appendix C, revised January 2003 (http://www.whitehouse.gov/omb/circulars/a024/a94_aprx-0.htm).

ONE-TIME COSTS AND RECURRING COST NOTES:

13. Costs include contingency.
14. Base costs are in 2002 dollars, fully burdened.
15. Costs are based on a ROM estimate.
16. Duration provided by VE Team.

INTERPOLATED CALC PER NISTIR-6968, PAGE 13, NOTE 15
0 TO 3 YRS: HOW MANY YEARS IS THIS STUDY
3 TO 5 YEARS: HOW MANY YEARS IS THIS STUDY

INTERPOLATED REAL DISCOUNT RATE	
YRS	INTERPOLATED REAL DISCOUNT RATE
0	0.00%
0	0.00%

Interpolated Real Rate for Discounting % (Per OMB & NISTIR-6968) (OMB) (r1)
Inflation Rate % (OMB) for 100 Yrs. (r2)

Rate
Escalated Interpolated Real Discount Rate $(1+r1)*(1+r2)$
Escalation $(1+r2)$

Compounding Value
Factor @
1.027000
1.027000

Count	Fiscal Year	Option #6	\$1,000's			Constant Dollars Total (Cash Flow) (c = a+b)	Compounded Escalation Factor @ 1.027 (d)	Lifecycle Costs (g = c*d)	Compounded @ Escalated Discount Factor @ 1.027 (f)	Net Present Worth (g = e/f)
			Constant Dollars One-Time Costs (a)	Constant Dollars Recurring Costs (b)	Escalated Interpolated Real Discount Rate (1+r1)*(1+r2)					
0	2004	Send the MLLW debris directly to ERDF for macro-encapsulation via engineered structural monolith	\$2,006.6			\$2,006.6	1.000	\$2,006.6	1,000000	\$2,006.6
1	2005	Send the MLLW debris directly to ERDF for macro-encapsulation via engineered structural monolith	\$2,564.9			\$2,564.9	1.027	\$2,634.2	1,027000	\$2,564.9
2	2006	Send the MLLW debris directly to ERDF for macro-encapsulation via engineered structural monolith	\$2,564.9			\$2,564.9	1.055	\$2,705.3	1,054729	\$2,564.9
Total			\$7,136.4			\$7,136.4		\$7,346.0		\$7,136.4

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Table 6-II. Option 9 – Cost Estimate for Sending Mixed Low-Level Waste Debris from CWC to PEcoS for Compaction and Macro, Then Dispose at ERDT. (2 Pages)

Description	Qty	Unit	Unit Costs		Labor Hours	Wage	Subtotals			Additional Costs		Total	Annual Costs			
			Mat'l	Subcon.			Unit Hr	Total Hr	\$/Hr	Mat'l	Labor	Subcon.	FY04	FY05	FY06	
CERCLA document development (PH)	1	1/s								140,000			140,000	140,000		
BTR to negotiate and issue PEcoS contract (PH)	1	ea			40	40	65			2,600			2,600	2,600		
Project implementation management (PH)	8,100	ea			0.6	4,860	65			315,900			315,900	63,180	126,360	126,360
Waste Data Administrator (PH)	8,100	ea			0.2	1,620	50			81,000			81,000	16,200	32,400	32,400
Overpack 55-gal packages at CWC (PH)																
NCO 3 @ 0.75 MH ea.	8,100	ea			2.25	18,225	55			1,002,375			1,002,375	200,475	400,950	400,950
RCT 2 @ 0.25 MH ea.	8,100	ea			0.5	4,050	55			222,750			222,750	44,550	89,100	89,100
PIC 1 @ 0.25 MH ea.	8,100	ea			0.25	2,025	65			131,625			131,625	26,325	52,650	52,650
Procure 85-gal overpacks (PH) (use four times)	2,025	ea	125							253,125			253,125	50,625	101,250	101,250
Ship packages from CWC to PEcoS (PH)																
NCO 3 @ 16 MH ea.	203	ea			48	9,744	55			535,920			535,920	107,184	214,368	214,368
RCT 2 @ 8 MH ea.	203	ea			16	3,248	55			178,640			178,640	35,728	71,456	71,456
Teamster 1 @ 4 hr	203	ea			4	812	50			40,600			40,600	8,120	16,240	16,240
Shipper 1 @ 24 MH ea.	203	ea			48	9,744	75			730,800			730,800	146,160	292,320	292,320
PIC 1 @ 2 MH ea.	203	ea			2	406	65			26,390			26,390	5,278	10,556	10,556
Contract transportation (PH)	203	ea		800						162,400			162,400	32,480	64,960	64,960
Contract G&A @ 20%	1	1/s								32,480			32,480	6,496	12,992	12,992
PEcoS compact and treat (PH)	8,100	ea		500						4,050,000			4,050,000	810,000	1,620,000	1,620,000
Contingency @ 15%										607,500			607,500	121,500	243,000	243,000

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Table 6-11. Option 9 – Cost Estimate for Sending Mixed Low-Level Waste Debris from CWC to PEcoS for Compaction and Macro, Then Dispose at ERDF. (2 Pages)

Description	Qty	Unit	Unit Costs		Labor Hours		Wage	Subtotals			Additional Costs		Total	Annual Costs		
			Mat'l	Subcont.	Unit Hr	Total Hr		Mat'l	Labor	Subcon.	G&A	Cap		FY04	FY05	FY06
Contract G&A @ 20%	1	lb									931,500		931,500	386,300	372,600	372,600
Contract transportation, ship packages from PEcoS to ERDF (PH)	81	ea		800							64,800		64,800	12,060	25,020	25,020
Contract G&A @ 20%	1	lb									12,960		12,960	2,592	5,184	5,184
Disposal at ERDF (BH)																
ERDF disposal charge per ton	1,458	ton		33							48,114		48,114	9,622.8	19,245.6	19,245.6
Contract G&A @ 25%	1	lb									12,029		12,029	2,405.7	4,811.4	4,811.4
TOTAL											3,583,508		3,583,508	2,036,782	3,776,363	3,776,363

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Table 6-12. Option 9 – Lifecycle and Net Present Worth Estimate.

LIFECYCLE AND NET PRESENT WORTH:

Costs in \$1,000's

TOTAL NET PRESENT WORTH (\$1,000's)	\$9,583.5
TOTAL LIFE CYCLE (\$1,000's)	\$9,583.5

JANUARY 2000 REAL DISCOUNT RATES

1 YRS	1.6%
3 YRS	1.9%

NET PRESENT WORTH NOTES:

The 2.7% is the published escalation rate for PY03 by DOE for LR work found in document #077073 from Planning & Controls (for the purpose of this analysis assumed escalation for subsequent years remains unchanged). The real discount rates come from OMB Circular No. A-94 Appendix C, revised January 2003 (http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html).

ONE-TIME CGSTS AND RECURRING COST NOTES:

- 17. Costs include contingency.
- 18. Base costs are in 2002 dollars, fully burdened.
- 19. Costs are based on a RCM estimate.
- 20. Duration provided by VR Team.

INTERPOLATED CALC PER NISTIR-6968, PAGE 13, NOTE 15
0 TO 3 YRS: HOW MANY YEARS IS THIS STUDY
3 TO 5 YEARS: HOW MANY YEARS IS THIS STUDY

YRS	INTERPOLATED REAL DISCOUNT RATE
0	0.00%
0	0.00%

Interpolated Real Rate for Discounting % (Per OMB & NISTIR-6968) (OMB) (1)
Inflation Rate % (DOE) for 100 Yrs. (2)

Rate 0.0%	Escalated Interpolated Real Discount Rate $(1+r_1) * (1+r_2)$	Compounding Value Factor @ 1.027000
2.7%	Escalation $(1+r_2)$	1.027000

Count	Fiscal Year	Option #9	\$1,000's	\$1,000's	\$1,000's	\$1,000's
			Constant Dollars One-Time Costs (a)	Constant Dollars Recurring Costs (b)	Constant Dollars Total (Cash Flow) (c = a+b)	Compounded Estimation Factor @ 1.027 (d)
0	2004	Send the MLLW debris from CWC to PECOS for compaction and macro-encapsulation, then dispose at ERDF	\$2,030.7		\$2,030.7	1.000
1	2005	Send the MLLW debris from CWC to PECOS for compaction and macro-encapsulation, then dispose at ERDF	\$3,776.4		\$3,776.4	1.027
2	2006	Send the MLLW debris from CWC to PECOS for compaction and macro-encapsulation, then dispose at ERDF	\$3,776.4		\$3,776.4	1.055
Total			\$9,583.5		\$9,583.5	1.000000
					\$9,392.1	\$9,583.5

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Table 6-13. Option 1 – Cost Estimate for Sending Mixed Low-Level Waste Debris Directly to ERDF,
Then Grout-Inject Drums and Macro. (3 Pages)

Description	Qty	Unit	Unit Costs		Labor Hours		Wage	Subtotals			Total	Annual Costs		
			Mat'l	Subcon	Unit Hr	Total Hr		Mat'l	Labor	Subcon		FY04	FY05	FY06
CBRCLA (FH)	1	ea									140,000	140,000	140,000	
Project implementation management (FH)	8,100	ea			0.6	4,860	\$5				315,900	63,180	126,360	126,360
Waste Data Administrator (FH)	8,100	ea			0.2	1,620	\$0				81,000	16,200	32,400	32,400
Install NucPills, allow 40/day (FH)														
NCO 2 @ 0.8 MH ea.	8,100	ea			1.6	12,960	\$5				712,800	142,560	285,120	285,120
RCT 1 @ 0.8 MH ea.	8,100	ea			0.9	6,480	\$5				356,400	71,280	142,560	142,560
PIC 1 @ 0.8 MH ea.	8,100	ea			0.8	6,480	\$5				421,200	84,240	168,480	168,480
Furnish NucPills (allowance)	8,100	ea	100					810,000			810,000	162,000	324,000	324,000
Overpack 35-gal packages at SWOC (FH)														
NCO 3 @ .75 MH ea.	4,050	ea			2.25	9,113	\$5				501,188	100,237.5	200,475	200,475
RCT 2 @ .25 MH ea.	4,050	ea			0.5	2,025	\$5				111,375	22,250	44,500	44,500
PIC 1 @ .25 MH ea.	4,050	ea			0.25	1,013	\$5				65,813	13,162.5	26,325	26,325
Procure 35-gal overpacks (FH) (use four times)	1,013	ea	125					126,625			126,625	25,325	50,650	50,650
Ship packages from SWOC to ERDF (FH)														
NCO 3 @ 8 MH ea.	152	ea			2d	3,548	\$5				200,640	40,128	80,256	80,256
RCT 1 @ 8 MH	152	ea			8	1,216	\$5				66,380	13,375	26,750	26,750
Teamster 1 @ 8 MH	152	ea			8	1,216	\$0				60,800	12,160	24,320	24,320
Shipper 1 @ 16 MH ea.	152	ea			16	2,432	\$0				182,400	36,480	72,960	72,960
PIC 1 @ 4 MH ea.	152	ea			4	608	\$5				39,520	7,904	15,808	15,808
Contract transportation (FH)	2,61	ea	80,000								200,000	200,000	40,000	80,000
Contract C&A @ 20%	1	ea									40,000	8,000	16,000	16,000

Table 6-13. Option 1 – Cost Estimate for Sending Mixed Low-Level Waste Debris Directly to ERDF, Then Grout-Inject Drums and Macro. (3 Pages)

Description	Qty	Unit	Unit Costs		Labor Hours		Wage	Subtotal			Total	Annual Costs					
			Mat'l	Subcon.	Unit Hr	Total Hr		Mat'l	Labor	Subcon.		FY04	FY05	FY06			
<i>Assume one-half (4,050 ea) of arriving drums are over-packed. Remove drums from over-packs.</i>																	
<i>Based on current 183-ft work (per J.James) 20 drum batches require 4 hours of 0.2 MH/ea. (Duratek)</i>																	
1 Laborer	4,050	ea			0.2	810	\$10	50		40,500	40,500	8,100	16,200	16,200			
1 HEO	4,050	ea			0.2	810	\$5	55		44,550	44,550	8,910	17,820	17,820			
1 RCT	4,050	ea			0.2	810	\$5	55		44,550	44,550	8,910	17,820	17,820			
<i>ERDF labor and support, stack drums two-high (Duratek)</i>																	
1 Laborer	8,100	ea			0.2	1,620	\$10	50		81,000	81,000	16,200	32,400	32,400			
1 HEO	8,100	ea			0.2	1,620	\$5	55		89,100	89,100	17,820	35,640	35,640			
1 RCT	8,100	ea			0.2	1,620	\$5	55		89,100	89,100	17,820	35,640	35,640			
<i>Equipment rental (Duratek)</i>																	
Forklift, 3000#	30	mo			1,500						45,000	9,000	18,000	18,000			
Truck mounted hydraulic lift, 12-ton	30	mo			4,050						121,500	24,300	48,600	48,600			
Scissor lift, 1000#, 12' H	30	mo			750						22,500	4,500	9,000	9,000			
<i>Grout inject drums (Duratek)</i>																	
1H 1 @ 0.67 MH	8,100	ea			0.5	4,050	\$5		222,750	222,750	44,550	89,100	89,100				
RCT 1 @ 0.67 MH	8,100	ea			0.5	4,050	\$5		222,750	222,750	44,550	89,100	89,100				
Pump Op. 1 @ 0.67 MH	8,100	ea			0.5	4,050	\$5		222,750	222,750	44,550	89,100	89,100				
Lab 1 @ 0.67 MH	8,100	ea			0.5	4,050	\$5		202,500	202,500	40,500	81,000	81,000				
Vac Op. 1 @ 0.67 MH	8,100	ea			0.5	4,050	\$5		222,750	222,750	44,550	89,100	89,100				
Lab 1 @ 0.67 MH	8,100	ea			0.5	4,050	\$5		202,500	202,500	40,500	81,000	81,000				
Forklift Op. 1 @ 0.67 MFT (for pitching operations)	8,100	ea			0.5	4,050	\$5		222,750	222,750	44,550	89,100	89,100				

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Table 6-13. Option 1 – Cost Estimate for Sending Mixed Low-Level Waste Debris Directly to ERDF, Then Grout-Inject Drums and Macro. (3 Pages)

Description	Qty	Unit	Unit Costs		Labor Hours		Wage \$/hr	Subtotals			Total	Annual Costs		
			Mat'l	Subcon	Unit hr	Total hr		Mat'l	Labor	Subcon		FY04	FY05	FY06
Grout costs, assume \$0/gal per 55-gal drum = 6.7 ccf/drum x \$8,100 = \$54,370 cf	54,370	ea					3.5				189,945	37,989	75,978	75,978
Grout pump, GroutKing "Super GROUTer," w/trailer	1	ea					12,250				12,250	12,250		
Duratek OH&P, B&O @ 16%											367,799	73,559.84	147,119.7	147,119.7
Management of change for auditable safety analysis (BHU)	1	hrs			80	80	63		5,200		5,200	1,040	2,080	2,080
Disposal at ERDF														
ERDF macro-encapsulation charge per drum (55-gal) (BII)	8,100	ea			63						520,300	105,300	210,600	210,600
ERDF disposal charge per ton	810	ton			31						26,730	5,345	10,692	10,692
Contact G&A @ 25% (BHU)	1	hrs									806,244	161,246.7	322,497.4	322,497.4
TOTAL											3,463,758	714,552	3,324,602	3,324,602

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Table 6-14. Option 1 – Lifecycle and Net Present Worth Estimate.

LIFECYCLE AND NET PRESENT WORTH:
Costs in \$1,000's

TOTAL NET PRESENT WORTH (\$1,000's)	\$8,463.8
TOTAL LIFE CYCLE (\$1,000's)	\$8,463.8

JANUARY 2000 REAL DISCOUNT RATES

3 YRS	1.6%
5 YRS	1.9%

NET PRESENT WORTH NOTES:

The 2.7% is the published escalation rate for FY03 by DOE for LR work found in document #077073 from Planning & Controls (for the purpose of this analysis assumed escalation for subsequent years remains unchanged). The real discount rates come from OMB Circular No. A-94, Appendix C, revised January 2003 (http://www.whitehouse.gov/omb/circulars/a094/a94_appx_c.html).

ONE-TIME COSTS AND RECURRING COST NOTES:

21. Costs include contingency.
22. Base costs are in 2002 dollars, fully burdened.
23. Costs are based on a ROM estimate.
24. Duration provided by VE Team.

INTERPOLATED CALC PER NMISTIR 6968, PAGE 13, NOTE 15
0 TO 3 YRS: HOW MANY YEARS IS THIS STUDY
3 TO 5 YEARS: HOW MANY YEARS IS THIS STUDY

INTERPOLATED REAL DISCOUNT RATE	
YRS	INTERPOLATED REAL DISCOUNT RATE
0	0.00%
0	0.00%

Interpolated Real Rate for Discounting % (Per OMB & NMISTIR 6968) (OMB) (r1)
Inflation Rate % (DOE) for 100 Yrs. (r2)

Rate:
0.0%
2.7%

Escalated Interpolated Real Discount Rate $(1+r1)^t(1+r2)$
Escalation $(1+r2)$

Compounding Value
Factor @
1.027000
1.027000

Count	Fiscal Year	Option 1	\$1,000's			Compounded Escalation Factor @ 1.027 (1)	Lifecycle Costs (\$ = e^rd) (2)	Compounded @ Escalated Discount Factor @ 1.027 (3)	\$1,000's
			Constant Dollars One-Time Costs (4)	Constant Dollars Recurring Costs (5)	Constant Dollars Total (Cash Flow) (e = r+d)				
0	2004	Send the MLLW debris from CWC to PRCoS for compaction and macro-encapsulation, then dispose at ERDW	\$1,814.6		\$1,814.6	1.000	\$1,814.6	1.000000	\$1,814.6
1	2005	Send the MLLW debris from CWC to PRCoS for compaction and macro-encapsulation, then dispose at PRDW	\$3,324.6		\$3,324.6	1.027	\$3,414.4	1.027000	\$3,324.6
2	2006	Send the MLLW debris from CWC to PRCoS for compaction and macro-encapsulation, then dispose at ERDW	\$3,324.6		\$3,324.6	1.053	\$3,506.6	1.053729	\$3,324.6
Total			\$8,463.8		\$8,463.8		\$8,735.5		\$8,463.8

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7.0 PHASE II.C. ADVANTAGES AND DISADVANTAGES OF "BASE CASE" AND "OPTIONS"

NOTE: The information in this section is taken from VE Study No. 0600X-VE-G002, which was conducted on May 25, 2004.

TEAM MEMBERS AND OTHER ATTENDEES

<u>NAME</u>	<u>PHONE</u>	<u>DISCIPLINE</u>	<u>CO.</u>
Mike A. Casbon	373-4012	ERDF Resident Engineer	BHI
Tom J. Lazarski	372-9216	Waste Operations PEL	BHI
Kevin C. Funke	521-2088	ERDF Rad Con Engineer	BHI
Randall W. Ohr	372-9131	ERC Project Controls – Estimator	BHI
Ryan P. Ollero	372-9139	ERC Waste Management Specialist	BHI
John L. Walsh	372-9123	ERC Product Controls	BHI
Dean E. Nester	373-4155	Waste Treatment & Disposal Project	FH
Nelson C. Little	375-4663	Project Engineering Manager	BHI
Mike F. Maxson	372-9697	Design Engineering – Nuclear	BHI

FACILITATOR

<u>NAME</u>	<u>PHONE</u>	<u>DISCIPLINE</u>	<u>CO.</u>
S. R. Parikh	372-9180	Project Engineering Manager Certified Value Specialist – Life	BHI

7.1 ADVANTAGES/DISADVANTAGES

The team members discussed the advantages and disadvantages of each of the potential "Options" and the "Base Case" and arrived at the points presented in Table 7-1.

7.2 FINAL RANKING

The team members compared the ranking based on LCCs and advantages/disadvantages and arrived at a final composite ranking shown in Table 7-2.

Table 7-1. Advantages/Disadvantages of Each of the Potential "Option(s)" and the "Base Case." (9 Pages)

PROJECT:	Treatment and Disposal of MLLW Debris in Drums from CWC				
LOCATION:	Hanford Site, Richland, Washington				
STUDY:	Value Engineering Study to Determine Cost Effective Retrieval, Treatment, and Disposal of MLLW in Drums				
FUNCTION:	Treat and Dispose MLLW Debris in Drums				
Item	Option Description	Advantages	Points*	Disadvantages	
Base Case	Send drums from CWC to PEcoS for compaction and macro-encapsulation, then dispose at the Mixed Waste Trench.	<ul style="list-style-type: none"> • No CERCLA action would be required (managed completely under RCRA authority) • Treatment and disposal could start immediately since this work is already being performed under the Mixed Waste Treatment and Disposal Project. • Fewer RadCon and safety concerns because drums would not be opened outside of a ventilated controlled facility • No permit/license modification required 	+1 +1 +1 +2	<ul style="list-style-type: none"> • Meeting DOT shipping requirements for offsite shipments • Product is handled multiple times • Does not meet the objectives set forth by the C3T committee on waste disposal at the Hanford Site • Would take up significant disposal space in the relatively small Mixed Waste Disposal Units, which could be better utilized for other onsite RCRA waste as well as for offsite MLLW • Waste is shipped off the Hanford Site and may be perceived as being more dangerous to Stakeholders and the public 	-3 -1 -3 -2 -1
Totals:			+5		-9

*Points:

Levels Advantage Total: +1 = Low
 +2 = Medium
 +3 = High

Levels Disadvantage Total: -1 = Low
 -2 = Medium
 -3 = High

Table 7-1. Advantages/Disadvantages of Each of the Potential "Option(s)" and the "Base Case." (9 Pages)

PROJECT:	Treatment and Disposal of MLLW Debris in Drums from CWC				
LOCATION:	Hanford Site, Richland, Washington				
STUDY:	Value Engineering Study to Determine Cost Effective Retrieval, Treatment, and Disposal of MLLW in Drums				
FUNCTION:	Treat and Dispose MLLW Debris in Drums				
Option 1	Send MLLW debris in drums from CWC directly to ERDF, then grout/inject drums at ERDF using negative pressure before disposal and macro-encapsulation in ERDF.	<ul style="list-style-type: none"> • Less structural stability risk for the ERDF • Current ERDF mega-macro-encapsulation techniques would be used • Relatively small capital costs required to start • No outside transportation required • Waste is not shipped off the Hanford Site and may be perceived as being less dangerous to stakeholders and the public 	+1 +2 +2 +2 +1	<ul style="list-style-type: none"> • Contamination levels inside drums will drive up protective requirements to workers and environment • Use of Nucliffs will be required for all drums, not just those without vent clips • Higher capacity Nucliffs may be needed, requiring replacement of those currently installed • A two-stage grouting process would be required • ERDF not equipped to handle this at this time, which could impact completion schedule • Air permit needs to be modified • Auditable safety analysis needs to be modified 	-3 -3 -2 -2 -1 -1 -1
Totals			+8		-11

*Points:

Levels Advantage Total:
 +1 = Low
 +2 = Medium
 +3 = High

Levels Disadvantage Total:
 -1 = Low
 -2 = Medium
 -3 = High

Advantages and Disadvantages of "Base Case" and "Options"

Table 7-1. Advantages/Disadvantages of Each of the Potential “Option(s)” and the “Base Case.” (9 Pages)

PROJECT:	Treatment and Disposal of MLLW Debris in Drums from CWC				
LOCATION:	Hanford Site, Richland, Washington				
STUDY:	Value Engineering Study to Determine Cost-Effective Retrieval, Treatment, and Disposal of MLLW in Drums				
FUNCTION:	Treat and Dispose MLLW Debris in Drums				
Option					
2	Send MLLW debris in drums from CWC directly to ERDF, then void fill drums using grout fill/glove bag at ERDF before disposal and macro-encapsulation in ERDF.	<ul style="list-style-type: none"> Less structural stability risk for the ERDF Current ERDF mega-macro-encapsulation techniques would be used Relatively small capital costs required to start No outside transportation required Waste is not shipped off the Hanford Site and may be perceived as being less dangerous to stakeholders and the public 	+1 +2 +2 +2 +1	<ul style="list-style-type: none"> Contamination levels inside drums will drive up protective requirements to workers and environment Use of NucFils will be required for all drums, not just those without vent clips Higher capacity NucFils may be needed, requiring replacement of those currently installed A two-stage grouting process would be required ERDF not equipped to handle this at this time, which could impact completion schedule AIR permit needs to be modified Auditible safety analysis needs to be modified RadCon and safety controls would be more difficult for this option 	-2 -2 -2 -2 -1 -1 -1 -1
Totals			+8		-12

*Points

Levels Advantage Total: +1 = Low
+2 = Medium
+3 = High

Levels Disadvantage Total: -1 = Low
-2 = Medium
-3 = High

Table 7-1. Advantages/Disadvantages of Each of the Potential "Option(s)" and the "Base Case." (9 Pages)

PROJECT:	Treatment and Disposal of MLLW Debris in Drums from CWC				
LOCATION:	Hanford Site, Richland, Washington				
STUDY:	Value Engineering Study to Determine Cost Effective Retrieval, Treatment, and Disposal of MLLW in Drums				
FUNCTION:	Treat and Dispose MLLW Debris in Drums				
Option 3	Send MLLW debris in drums/overpacks from CWC to PEcoS for super-compaction before sending to ERDF for disposal and macro-encapsulation in ERDF.	<ul style="list-style-type: none"> • Fewer RadCon and safety concerns because drums would not be opened at the ERDF • Current ERDF mega-macro-encapsulation techniques would be used • Less structural stability risk for the ERDF • No modifications to auditable safety analysis 	+1 +2 +1 +1	<ul style="list-style-type: none"> • Meeting DOT shipping requirements for offsite shipments • Multiple handling of containers is required • Waste is shipped off the Hanford Site and may be perceived as being more dangerous to stakeholders and the public 	-2 -1 -1
Totals			+5		-4

*Points:

Levels Advantage Total:
 +1 = Low
 +2 = Medium
 +3 = High

Levels Disadvantage Total:
 -1 = Low
 -2 = Medium
 -3 = High

Table 7-1. Advantages/Disadvantages of Each of the Potential "Option(s)" and the "Base Case." (9 Pages)

PROJECT:	Treatment and Disposal of MLLW Debris in Drums from CWC				
LOCATION:	Hanford Site, Richland, Washington				
STUDY:	Value Engineering Study to Determine Cost Effective Retrieval, Treatment, and Disposal of MLLW in Drums				
FUNCTION:	Treat and Dispose MLLW Debris in Drums				
Option 4	Send MLLW debris in drums from CWC directly to a new super-compactor near ERDF for super-compaction, then disposal and macro-encapsulation in ERDF.	<ul style="list-style-type: none"> • Current ERDF mega-macro techniques would be used • No offsite transportation required • Sets up a process and infrastructure that can be used for other waste stream types • Waste is not shipped off the Hanford Site and may be perceived as being less dangerous to Stakeholders and the public 	+2 +2 +1 +1	<ul style="list-style-type: none"> • ERDF is not set up for this work at this time • Will impact schedule completion date • Could make ERDF a Category 3 facility if not set up as a separate facility • Major auditable safety analysis modification required • Would require significant procedural groundwork to develop a new facility • Need to buy compactor, set up building, get permitting, etc. 	-1 -2 -3 -3 -3 -2 -13
Totals			+6		

*Points:

Levels Advantage Total: +1 = Low
 +2 = Medium
 +3 = High

Levels Disadvantage Total: -1 = Low
 -2 = Medium
 -3 = High

Table 7-1. Advantages/Disadvantages of Each of the Potential "Option(s)" and the "Base Case." (9 Pages)

PROJECT:	Treatment and Disposal of MLLW Debris in Drums from CWC				
LOCATION:	Hanford Site, Richland, Washington				
STUDY:	Value Engineering Study to Determine Cost Effective Retrieval, Treatment, and Disposal of MLLW in Drums				
FUNCTION:	Treat and Dispose MLLW Debris in Drums				
Option 5	<ul style="list-style-type: none"> • Send MLLW debris in drums from CWC directly to ERDF for disposal and macro-encapsulation within procured high-integrity containers placed in ERDF. • Technology is easily adaptable to the ERDF • Drum entry at the ERDF is not required • No air permit modification required • No outside transportation required • Waste is not shipped off the Hanford Site and may be perceived as being less dangerous to stakeholders and the public 	+2 +1 +1 +2 +1	<ul style="list-style-type: none"> • Poorest utilization of landfill space • More labor intensive • Vaults would need to be recertified to ERDF burial depth and longevity requirements • Auditable safety analysis needs to be modified 	-1 -3 -1 -1	
Totals		+7		-6	

*Points:

Levels Advantage Total:
 +1 = Low
 +2 = Medium
 +3 = High

Levels Disadvantage Total:
 -1 = Low
 -2 = Medium
 -3 = High

Phase IIC:

Advantages and Disadvantages of "Base Case" and "Options"

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Table 7-1. Advantages/Disadvantages of Each of the Potential "Option(s)" and the "Base Case." (9 Pages)

PROJECT:	Treatment and Disposal of MLLW Debris in Drums from CWC				
LOCATION:	Hanford Site, Richland, Washington				
STUDY:	Value Engineering Study to Determine Cost Effective Retrieval, Treatment, and Disposal of MLLW in Drums				
FUNCTION:	Treat and Dispose MLLW Debris in Drums				
Option 6	Send MLLW debris in drums from CWC directly to ERDF for disposal and macro-encapsulation within designed and constructed structural vault in ERDF.	<ul style="list-style-type: none"> • Better space allocation than using pre-formed HICs • Technology is easily adaptable to the ERDF • Drum entry at the ERDF is not required • No air permit modification required • No outside transportation required • Waste is not shipped off the Hanford Site and may be perceived as being less dangerous to stakeholders and the public 	+1 +2 +1 +1 +2 +1	<ul style="list-style-type: none"> • Vaults would need to be recertified to ERDF burial depth and longevity requirements • Audit able safety analysis needs to be modified 	-1 -1
Totals			+8	-2	

*Points:

Levels Advantage Total: +1 = Low
+2 = Medium
+3 = High

Levels Disadvantage Total: -1 = Low
-2 = Medium
-3 = High

Table 7-1. Advantages/Disadvantages of Each of the Potential "Option(s)" and the "Base Case." (9 Pages)

PROJECT:	Treatment and Disposal of MLLW Debris in Drums from CWC				
LOCATION:	Hanford Site, Richland, Washington				
STUDY:	Value Engineering Study to Determine Cost Effective Retrieval, Treatment, and Disposal of MLLW in Drums				
FUNCTION:	Treat and Dispose MLLW Debris in Drums				
Option 7	<ul style="list-style-type: none"> Send MLLW debris in drums from CWC directly to ERDF for disposal and macro-encapsulation within ERC designed and procured structural horizontal pipes placed in ERDF. 	<ul style="list-style-type: none"> Technology is easily adaptable to the ERDF Drum entry at the ERDF is not required No air permit modification required No outside transportation required Waste is not shipped off the Hanford Site and may be perceived as being less dangerous to stakeholders and the public 	+2 +1 +1 +2 +1	<ul style="list-style-type: none"> ERDF not set up to perform this at this time, which could impact scheduled completion date Structural design is needed in order to evaluate this option Drum handling may be difficult Auditable safety analysis needs to be modified 	-1 -1 -2 -1
Totals			+7		-5

*Points:

Level's Advantage Total: +1 = Low
+2 = Medium
+3 = High

Level's Disadvantage Total: -1 = Low
-2 = Medium
-3 = High

Table 7-1. Advantages/Disadvantages of Each of the Potential "Option(s)" and the "Base Case." (9 Pages)

PROJECT:	Treatment and Disposal of MLLW Debris in Drums from CWC				
LOCATION:	Hanford Site, Richland, Washington				
STUDY:	Value Engineering Study to Determine Cost Effective Retrieval, Treatment, and Disposal of MLLW in Drums				
FUNCTION:	Treat and Dispose MLLW Debris in Drums				
Option 8	Send MLLW debris in drums from CWC directly to ERDF, then void fill drums with grout injection to meet macro-encapsulation before disposal in ERDF. (This assumes that injected drums require no further macro-encapsulation.)	<ul style="list-style-type: none"> • Less structural stability risk for the ERDF • Current ERDF mega-macro-encapsulation techniques would be used • Relatively small capital costs required to start • No outside transportation required • Waste is not shipped off the Hanford Site and may be perceived as being less dangerous to stakeholders and the public • The additional step of macro-encapsulating drums would not be needed 	+1 +2 +2 +2 +1 +1	<ul style="list-style-type: none"> • Contamination levels inside drums will drive up protective requirements to workers and environment • Use of Nucliffs will be required for all drums, not just those without vent clips • Higher capacity Nucliffs may be needed, requiring replacement of those currently installed • A two-stage grouting process would be required • ERDF not equipped to handle this at this time, which could impact completion schedule • Air permit needs to be modified • Regulatory validity of this method would need to be determined • Auditabile safety analysis needs to be modified 	-3 -2 -2 -2 -1 -1 -2 -1
Totals			+9		-13

*Points:

Levels Advantage Total:
 +1 = Low
 +2 = Medium
 +3 = High

Levels Disadvantage Total:
 -1 = Low
 -2 = Medium
 -3 = High

Table 7-1. Advantages/Disadvantages of Each of the Potential "Option(s)" and the "Base Case." (9 Pages)

PROJECT:	Treatment and Disposal of MLLW Debris in Drums from CWC				
LOCATION:	Hanford Site, Richland, Washington				
STUDY:	Value Engineering Study to Determine Cost Effective Retrieval, Treatment, and Disposal of MLLW in Drums				
FUNCTION:	Treat and Dispose MLLW Debris in Drums				
Option 9	Send MLLW debris in drums from CWC to PEcoS for super-compaction and macro-encapsulation before sending to ERDF for disposal.	<ul style="list-style-type: none"> • Disposal at ERDF is immediately available with this option. • Fewer RadCon and safety concerns because drums would not be opened at the ERDF. • No air permit modification required. • No modifications to auditable safety analysis 	+3 +1 +1 +1	<ul style="list-style-type: none"> • Meeting DOT shipping requirements for offsite shipments • Product is handled multiple times • Waste is shipped off the Hanford Site and may be perceived as being more dangerous to stakeholders and the public 	-2 -1 -1
Totals			+6	-4	

***Points:**

Levels Advantage Total: +1 = Low
 +2 = Medium
 +3 = High

Levels Disadvantage Total: -1 = Low
 -2 = Medium
 -3 = High

Table 7-2. Summary of Final Ranking Comparisons.

PROJECT: Treatment and Disposal of the MLLW Retrieved from LLBG 218-W-4C
LOCATION: Hanford Site, Richland, Washington
STUDY: Value Engineering Study to Determine Cost-Effective Retrieval, Treatment, and Disposal of MLLW in Drums
FUNCTION: Treat and Dispose MLLW Debris in Drums

Item	Description	Ranking Based on LCC Estimates	Ranking Based on Advantages/Disadvantages	Composite Final Ranking
Base Case	Send drums from CWC to PEcoS for compaction and macro-encapsulation, then dispose at the Mixed Waste Trench	6	6	7
Option 1	Send MLLW debris in drums from CWC directly to ERDF, then grout inject drums at ERDF using negative pressure before disposal and macro-encapsulation in ERDF	3	5	4
Option 3	Send MLLW debris in drums/overpacks from CWC to PEcoS for super-compaction before sending to ERDF for disposal and macro-encapsulation in ERDF	4	3	2
Option 4	Send MLLW debris in drums from CWC directly to a new super-compactor near ERDF for super-compaction, then disposal and macro-encapsulation in ERDF	2	7	5
Option 5	Send MLLW debris in drums from CWC directly to ERDF for disposal and macro-encapsulation within procured high-integrity containers placed in ERDF	7	4	6
Option 6	Send MLLW debris in drums from CWC directly to ERDF for disposal and macro-encapsulation within ERC-designed and constructed structural vault in ERDF	1	1	1
Option 9	Send MLLW debris in drums from CWC to PEcoS for super-compaction and macro-encapsulation before sending to ERDF for disposal	5	2	3

8.0 RECOMMENDATIONS FOR IMPLEMENTATION

In order to capture the impact of other attributes that were used in this VE study, the team members determined and compiled rankings based on (1) LCCs, and (2) advantages and disadvantages, and arrived at composite Final Rankings (shown in Table 6-2) for the "Base Case" and the selected "Options." The composite Final Rankings shown in Table 6-2 provided an additional tool besides the cost in making final recommendation.

The "Base Case" and all selected "Options" were carefully reviewed from the point of view of least potential LCC and best final ranking as follows.

Although "Option 4" had a lower LCC (\$8,126,600) than "Option 1," its disadvantages were more severe than those for "Option 1." Therefore "Option 4" received poorer ranking (#5) than "Option 1 (#4)."

Similarly, "Option 3," though more expensive than "Option 1," its disadvantages were less severe than those for "Option 1," hence it received a better ranking (#2) than "Option 1."

Due to substantially higher LCCs, the "Base Case" and "Options 5 and 9" were not considered for recommendation.

In the final analysis, it was unanimously determined by the team members that "Option 6," with least LCC of \$7,346,000 and best final ranking of No. 1, provided the best solution for treatment and disposal of MLLW retrieved from Burial Ground 218-W-4C.

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Recommendations for Implementation

9.0 REFERENCES

- BHI Planning and Controls File #907, *Treatment and Disposal of the Mixed Low-Level Waste Retrieved from Burial Ground 218-W-4C* [contains estimates, supporting documentation, notes, vendor information, wage rates, unit rates, and assumptions that were prepared for or used in this VE Study], Bechtel Hanford, Inc., Richland, Washington.
- BHI No. 0600X-VE-G0002, *Value Engineering Study for Treatment and Disposal of the Mixed Low-Level Waste Retrieved from Burial Ground 218-W-4C, FY 2004*, Bechtel Hanford, Inc., Richland, Washington.
- Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, 42 U.S.C. 9601, et seq.
- Duratek Subcontract No. 0600X-SC-G0006, Change Notice No. 230, *Design and Construction of Mega Pour Pad*, dated May 28, 2003, Duratek Federal Services of Hanford, Inc., Richland, Washington.
- Ecology, EPA, and DOE, 2003, *Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement)*, 2 vols., as amended, 89-10, Rev. 6, Washington State Department of Energy, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.
- Resource Conservation and Recovery Act of 1976*, 42 U.S.C. 6901, et seq.

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